



*Handwritten signature/initials*

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Issue Application of:

Sanford D. Markowitz

Serial No: 10/649,591

Filed: August 26, 2003

For: Methods and Compositions for  
Categorizing Patients

Confirmation No: 4997

Art Unit: 1645

Examiner: To be assigned

**CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)**

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to: MS Petition, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 on the date indicated below:

1/6/05

Date of Signature  
and of Mail Deposit

*Handwritten signature of Paula J. Felteau*  
PAULA J. FELTEAU

MS Petition  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

**PETITION TO MAKE SPECIAL UNDER 37 C.F.R. 1.102**

Sir:

Pursuant to 37 C.F.R. 1.102 and MPEP 708.02, Subsection X (SPECIAL STATUS FOR INVENTIONS RELATING TO HIV/AIDS AND CANCER), Applicants hereby petition to make special the instant application, titled "METHODS FOR CATEGORIZING PATIENTS," filed on August 26, 2003 by Dr. Sanford Markowitz (U.S.S.N. 10/649,591). Applicants request the required petition fee under 37 C.F.R. 1.17(h) be charged to **Deposit Account No. 18-1945**.

Subsection X requires that the petition for special status be accompanied by a statement explaining how the invention contributes to the diagnosis, treatment or prevention of HIV/AIDS or cancer. Accordingly, a signed Statement from the inventor, Dr. Sanford Markowitz, is attached hereto as Attachment A, describing how the invention contributes to the diagnosis and treatment of colon cancer (also commonly referred to as colorectal cancer). Dr. Markowitz is a

01/11/2005 SDENBOB1 00000111 181945 10649591  
01 FC:1464 130.00 DA

world-renowned expert in the field of colon cancer, as established by the curriculum vitae, Attachment B.

The present application provides a number of inventions relating to the diagnosis and treatment of colon cancer, and a reasonably searchable set of claims directed to such inventions is presented in the accompanying Preliminary Amendment. According to the Statement of Dr. Markowitz, cancers of the colon and rectum are the second leading cause of cancer incidence and of cancer death among adult Americans, with 135,000 new cases and 57,000 deaths in 2001. Americans have a 6% lifetime risk of developing the disease. Colon cancers are understood to develop from premalignant growths termed “adenomas”. In concept, most colon cancers could be prevented by detection and removal of colon adenomas. Likewise, the cure rate for early stage colon cancer is very high, and therefore it is expected that detection of colon cancers at early stages of the disease would greatly reduce mortality. For these reasons, the medical community has recommended mass screening for colon cancers and adenomas starting at age 50 for the average risk adult population, and earlier for individuals at higher risk. The general consensus of the medical community is that colon cancer is a disease that can be best managed through early detection and surgical treatment.

As noted by Dr. Markowitz, the techniques for early detection are not optimal. Colonoscopy is the “gold standard” diagnostic technique, but colonoscopy is expensive, invasive and time consuming. It is doubtful if the healthcare system has adequate financial and medical resources to adopt a strategy of colonoscopic screening of the entire American average risk population. A simpler detection technique, sigmoidoscopy, does not permit visualization of the entire colon, and therefore cannot provide the same sensitivity as colonoscopy.

These factors have prompted Dr. Markowitz to seek additional diagnostic techniques. As described in the present application, Dr. Markowitz has identified novel molecular markers of precancerous and cancerous colorectal tissue. One particular marker, termed ColoUp2, holds great promise. ColoUp2 is selectively expressed in clinical samples from precancerous and cancerous colon tissue and, further, ColoUp2 is secreted from cells of colonic lineage. Therefore, Dr. Markowitz expects that the detection of ColoUp2 in the blood or other readily accessible bodily fluids will provide a rapid, inexpensive and highly effective indicator of a

precancerous or cancerous state. It is expected that such a diagnostic test would greatly reduce the mortality rate from colon cancer

Dr. Markowitz and the sponsoring institutions, Case Western Reserve University and the Howard Hughes Medical Institute, are actively seeking to bring a ColoUp2-based diagnostic into the clinic. In filing the present application, Dr. Markowitz and Case Western Reserve University have met the two stated policy goals of the Section X petition to make special: the patent application provided a clear public disclosure of the discovery in a timely manner, and it is expected that the patent position will attract the investment needed to bring this invention to the clinic.

Accordingly, Applicants request that the present application be granted special status and an expedited review by the Patent Office. Applicants assert that the present petition with the accompanying Statement from Dr. Sanford Markowitz and the fee under 37 CFR 1.17(h) meets all the criteria of 37 CFR 1.102 and MPEP 708.02 Subsection X.

In addition, solely to expedite prosecution, a Preliminary Amendment is filed herewith to simplify the claims pending in the expedited application.

#### CONCLUSION

In view of the foregoing amendments and remarks, Applicants submit that the pending claims are in condition for rapid examination and allowance. The Examiner may address any questions raised by this submission to the undersigned at 617-951-7000. Should any additional charges be necessary, please charge to **Deposit Account No. 18-1945**.

Date: 1/5/05

**Customer No: 28120**  
Docketing Specialist  
Ropes & Gray, LLP  
One International Place  
Boston, MA 02110  
Tel. 617-951-7000  
Fax: 617-951-7050

Respectfully Submitted,



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John Quisel, Ph.D.  
Patent Agent  
Reg. No. 47,874



PTO/SB/17 (12-04v2)

Approved for use through 7/31/2006. OMB 0651-0032  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no person are required to respond to a collection of information unless it displays a valid OMB control number.

<b>FEE TRANSMITTAL</b> <b>For FY 2005</b>		<b>Complete if Known</b>	
		Application Number	10/649,591
		Filing Date	August 26, 2003
		First Named Inventor	Sanford D. Markowitz
		Examiner Name	Not Yet Assigned
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27		Art Unit	1645
<b>TOTAL AMOUNT OF PAYMENT</b>	<b>(\$)</b> 130.00	Attorney Docket No.	CWRU-P03-003

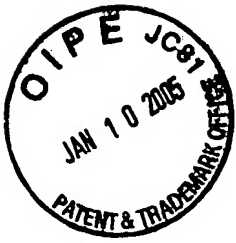
<b>METHOD OF PAYMENT</b> (check all that apply)	
<input type="checkbox"/> Check	<input type="checkbox"/> Credit Card
<input type="checkbox"/> Money Order	<input type="checkbox"/> None
<input type="checkbox"/> Other (please identify): _____	
<input checked="" type="checkbox"/> Deposit Account	Deposit Account Number: <u>18-1945</u> Deposit Account Name: <u>Ropes &amp; Gray LLP</u>
For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)	
<input checked="" type="checkbox"/> Charge fee(s) indicated below	<input type="checkbox"/> Charge fee(s) indicated below, except for the filing fee
<input checked="" type="checkbox"/> Charge any additional fee(s) or underpayment of fee(s) under 37 CFR 1.16 and 1.17	<input checked="" type="checkbox"/> Credit any overpayments

<b>FEE CALCULATION</b>							
<b>1. BASIC FILING, SEARCH, AND EXAMINATION FEES</b>							
	<b>FILING FEES</b>		<b>SEARCH FEES</b>		<b>EXAMINATION FEES</b>		
		<u>Small Entity</u>		<u>Small Entity</u>		<u>Small Entity</u>	
<b>Application Type</b>	<b>Fee (\$)</b>	<b>Fee (\$)</b>	<b>Fee (\$)</b>	<b>Fee (\$)</b>	<b>Fee (\$)</b>	<b>Fee (\$)</b>	<b>Fees Paid (\$)</b>
Utility	300	150	500	250	200	100	_____
Design	200	100	100	50	130	65	_____
Plant	200	100	300	150	160	80	_____
Reissue	300	150	500	250	600	300	_____
Provisional	200	100	0	0	0	0	_____
<b>2. EXCESS CLAIM FEES</b>							
<b>Fee Description</b>	<b>Fee (\$)</b>	<b>Small Entity Fee (\$)</b>					
Each claim over 20 (including Reissues)	50	25					
Each independent claim over 3 (including Reissues)	200	100					
Multiple dependent claims	360	180					
<b>Total Claims</b>	<b>Extra Claims</b>	<b>Fee (\$)</b>	<b>Fee Paid (\$)</b>	<b>Multiple Dependent Claims</b>			
_____	_____	_____	_____	<b>Fee (\$)</b> <b>Fee Paid (\$)</b>			
<b>Indep. Claims</b>	<b>Extra Claims</b>	<b>Fee (\$)</b>	<b>Fee Paid (\$)</b>				
_____	_____	_____	_____				
<b>3. APPLICATION SIZE FEE</b>							
If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
<b>Total Sheets</b>	<b>Extra Sheets</b>	<b>Number of each additional 50 or fraction thereof</b>	<b>Fee (\$)</b>	<b>Fee Paid (\$)</b>			
_____	_____	_____	_____	_____			
<b>4. OTHER FEE(S)</b>							
Non-English Specification, \$130 fee (no small entity discount)				<b>Fees Paid (\$)</b>			
Other (e.g., late filing surcharge): 1464 Petitions to the Director not specifically ...				130.00			

<b>SUBMITTED BY</b>			
Signature		Registration No. (Attorney/Agent)	47,874
Name (Print/Type)	John D. Quisel	Telephone	(617) 951-7685
		Date	January 6, 2005

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail, in an envelope addressed to: MS Petition, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date shown below.

Dated: 1/6/05Signature: Paula Depelteau (Paula Depelteau)



## Attachment A

### Statement of Dr. Sanford Markowitz

U.S. Patent Application No. Serial No: 10/649,591

Filed: August 26, 2003

Title: Methods and Compositions for Categorizing Patients

By: Sanford D. Markowitz



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application of:

Markowitz *et al.*

Serial No: 10/649,591

Filed: August 26, 2003

For: Methods and Compositions for  
Categorizing Patients

Confirmation No. 4997

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\_\_\_\_\_  
Date of Signature  
and of Mail Deposit

MS Petition  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

**STATEMENT OF DR. SANFORD MARKOWITZ**

I, Dr. Sanford Markowitz, do state as follows:

Qualifications

1. I am a named inventor of the above-identified patent application ("the Application"), and of the subject matter described and claimed therein. I am providing this statement in support of the Petition to Make Special for the Application.
2. I presently hold the position of Markowitz-Ingalls Professor of Cancer Genetics, Department of Medicine, Case Western Reserve University, and I am an Investigator with the

Howard Hughes Medical Institute. I received both my M.D. and Ph.D. from Yale University, and I have been conducting research in cancer, with a particular focus on colon cancer, since at least 1984. Additional description of my professional qualifications may be found in the Curriculum Vitae, provided as Attachment B.

Colon cancer is a major public health problem.

3. Cancers of the colon and rectum are the second leading cause of cancer incidence and of cancer death among adult Americans, with 135,000 new cases and 57,000 deaths in 2001, and with a 6% lifetime risk of developing the disease (1). Colon cancers are the end result of a multistep process of colon neoplasia that extends over several years, in which first, neoplastic tubular colon adenomas arise as pedunculated polypoid structures growing into the colon lumen (2). With time these adenomas acquire increasingly disordered villous histology and dysplastic cellular cytology, and are then recognized as frank cancers when invasive cells first breach the underlying epithelial basement membrane (2). The risk that a colonic neoplasm harbors frank cancer increases linearly with size, with a roughly 10% likelihood that a 1 cm colon neoplasm will harbor regions of frank cancer (3). In concept, most colon cancers could be prevented by detection and removal of premalignant colon adenomas (4). Likewise, considerable benefit would be predicted by detecting colon cancers at early stages of the disease, as node negative stage I and stage II colon cancers that have not spread beyond the colon itself are respectively 90% and 75% cured with surgery (3). These considerations have lead to recommendations for mass screening for colon cancers and adenomas starting at age 50 for the average risk adult population, and earlier for individuals at higher risk due to family history or other predisposing factors (5, 6).

Effective non-invasive screening for colon cancer is not currently available.

4. Currently available screening modalities for colon cancer include endoscopic visualization of the lower portion of the colon by sigmoidoscopy, with sensitivity for detecting cancer of 60%, or full endoscopic visualization of the colon by colonoscopy, with sensitivity for detecting cancer of 90% or greater (5, 6). The adoption of mass colonoscopic screening has been

impeded by the expense of the procedure and the 24 hours required to undergo both a pre-test laxative preparation and a post-test recovery from sedation. Moreover, it is doubtful if the healthcare system has adequate financial and medical resources to indeed adopt a strategy of colonoscopic screening of the entire American average risk population. Thus, the ideal situation would be one in which individuals could be selected for colonoscopy based on a prior initial screening procedure that would identify individuals at high likelihood to truly bear colon cancers, or late stage advanced colon adenomas of size greater than 1cm that show the greatest risk of giving rise to colon cancers. Such an ideal screening modality would be noninvasive, inexpensive, highly sensitive, and with good positive predictive value. The current standard non-invasive screening test for colon cancer is testing for the presence of occult blood in the stool (5, 6). Improved molecular screening of stool is of interest (7), though clinical studies have thus far been of small size, and public acceptance remains uncertain due to the large volumes of stool that currently must be collected and shipped for these assays. Blood testing for cancer would likely enjoy wide public acceptance, but the one established serologic marker of colon neoplasia, carcinoembryonic antigen (CEA), has not performed well in studies employing large and varied control populations (8). Accordingly, it remains an important goal to search for a serologic marker that would have the desirable specificity and sensitivity, especially for detection of early stage cancers as well as adenomas.

The Application describes a promising diagnostic technique.

5. The Application describes a number of molecular markers that may be used in a blood-based colon cancer diagnostic test. As I understand it, the claims as presented are focused on ColoUp2. I consider ColoUp2 to be an extremely promising molecular marker for colon cancer and adenomas, and I am actively working to bring this diagnostic technique into the clinic.

Literature Cited

1. Greenlee RT, Hill-Harmon MB, Murray T, Thun M. Cancer statistics, 2001. CA Cancer J Clin 2001;51(1):15-36.
2. Markowitz S, Dawson DM, Willis J, Willson JK. Focus on colon cancer. Cancer Cell 2002;1:233-236.



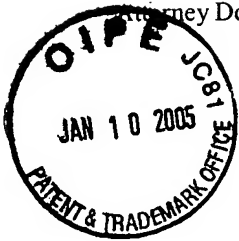
Attorney Docket No.: CWRU-P03-003

3. Skibber J, Minsky B, Hoff P. Cancer of the colon. In: DeVita V, Hellman S, Rosenberg S, editors. Cancer: Principles and practice of oncology. 6th ed. Philadelphia: Lippincott Williams and Wilkins; 2001. p. 1216-1271.
4. Winawer S, Zauber A, Ho M, O'Brien M, Gottlieb L, Sternberg S, et al. Prevention of colorectal cancer by colonoscopic polypectomy. N. Engl. J. Med. 1993;329:1977-1981.
5. Schoen RE. Science and Society: the case for population based screening for colorectal cancer. Nature Reviews Cancer 2002;2:65-70.
6. Smith RA, Cokkinides V, von Eschenbach AC, Levin B, Cohen C, Runowicz CD, et al. American Cancer Society guidelines for the early detection of cancer. CA Cancer J Clin 2002;52(1):8-22.
7. Ahlquist DA, Shuber AP. Stool screening for colorectal cancer: evolution from occult blood to molecular markers. Clin Chim Acta 2002;315(1-2):157-68.
8. Ransohoff D, Feinstein A. Problems of spectrum and bias in evaluating the efficacy of diagnostic tests. N Engl J Med 1978;299:926-30.

Date: 12-30-04

Signed: Sanford Markowitz MD, PhD

Dr. Sanford Markowitz



## Attachment B

### Curriculum Vitae of Dr. Sanford Markowitz

U.S. Patent Application No. Serial No: 10/649,591

Filed: August 26, 2003

Title: Methods and Compositions for Categorizing Patients

By: Sanford D. Markowitz



## CURRICULUM VITAE

**NAME:** Sanford Markowitz, M.D., Ph.D.

**DATE & PLACE OF BIRTH:** April 19, 1952 - Pittsburgh, Pennsylvania

**BUSINESS ADDRESS (U.S. MAIL):** Howard Hughes Medical Institute Laboratories  
Wolstein Research Building, 3<sup>rd</sup> Floor  
Mailstop 7285  
Case Western Reserve University  
10900 Euclid Avenue  
Cleveland, OH 44106-7285

PHONE: 216.368.1976 - FAX: 216.368.8928

**BUSINESS ADDRESS (SHIPPING):** Howard Hughes Medical Institute Laboratories  
Wolstein Research Building, 3-101  
2103 Cornell Road  
Cleveland, OH 44106-7285

**HOME ADDRESS:** 28950 Bolingbrook, Pepper Pike, OH 44124  
PHONE: 216.378.0195  
email: sxm10@po.cwru.edu

**LICENSURE & CERTIFICATION:**

1982	State of Illinois--#036-065140
1984	Certified in Internal Medicine, ABIM
1987	State of Ohio----#055623
1987	Certified in Medical Oncology

**EDUCATION:**

1974	A.B., Summa Cum Laude - Chemistry & Physics Harvard College - Cambridge, Massachusetts
1974	M.A., Chemistry - Harvard University - Cambridge, Massachusetts
1980	MD, Yale University Medical School - New Haven, Connecticut
1980	PhD, Cell Biology - Yale University- New Haven, Connecticut Thesis Advisor: Dr. Vincent Marchesi

**PROFESSIONAL TRAINING:**

1974-1980	Member, MD-PhD Program - Yale University
1980-1981	Research Fellow, Infectious Disease - Yale University Medical School
1981-1984	Resident, Internal Medicine - University of Chicago Hospitals & Clinics, Chicago, Illinois
1984-1987	Fellow, Clinical Oncology - National Cancer Institute Member of the Molecular Biology Laboratory, NCI Navy Medical Oncology Branch - Bethesda, Maryland Lab Chief: Dr. John Minna

**HONORS & AWARDS:**

1970	National Merit Scholar
1970	Harvard National Scholar
1972	1st Prize in Society of Actuaries National Collegiate Mathematics Competition

1972	Phi Beta Kappa
1980	Recipient James Hudson Brown Prize Postdoctoral Fellowship, Yale Medical School
1987	Recipient American Society of Clinical Oncology-Upjohn Travel Award for Research
1989	Recipient NIH First Award
1994	Recipient ACS Faculty Research (Salary) Award
2000	Recipient: Ohio State University Human Cancer Genetics Program Commemorative Medal
2000	Petros Palandjian Visiting Professor in Gastrointestinal Oncology, Harvard Medical School

**AWARDED PATENTS/LICENSED INVENTIONS:**

1979	Monoclonal antibodies specific for human neutrophil surface membrane antigens. Co-inventor with Harry Malech, MD Licensed for commercial production by Miles Laboratories through Yale University.
1999	Cancer diagnosis, prognosis and therapy based on mutations in TGF- $\beta$ receptors, U.S. Patent 5,866,323, assigned to Case Western Reserve University.
2001	Cancer Diagnosis and therapy based on mutations in TGF- $\beta$ receptors, U.S. Patent 6,291,237, assigned to Case Western Reserve University.
2003	Cancer Diagnosis and therapy based on mutations in TGF- $\beta$ receptors, U.S. Patent 6,630,326, assigned to Case Western Reserve University.

**PROFESSIONAL APPOINTMENTS:**

1987- 11/87-06/93	Attending Physician - University Hospitals of Cleveland Assistant Professor of Medicine Case Western Reserve University School of Medicine
01/91-	Co-appointed in Department of Molecular Biology & Microbiology Case Western Reserve University
07/93-06/97	Associate Professor of Medicine Case Western Reserve University (with tenure, 1995)
07/97-	Markowitz-Ingalls Professor of Cancer Genetics, Department of Medicine, Case Western Reserve University
02/98-05/03	Associate Investigator, Howard Hughes Medical Institute
05/03-	Investigator, Howard Hughes Medical Institute

**PROFESSIONAL & SCIENTIFIC GROUP MEMBERSHIPS:**

1985-	American Association for Advancement of Science
1985-	American Association for Cancer Research
1989-	Eastern Cooperative Oncology Group
1995-	American Society of Clinical Investigation

**SERVICE TO INSTITUTION:**

	<u>Local</u>
05/93-05/94	Medical & Scientific Committee, American Cancer Society, Ohio Division
06/97-08/97	Mentor for ASCI sponsored high school teacher summer research fellowship for Ms. Evelyn Bradshaw, Cleveland Hts., OH
	<u>Institutional Committees</u>
1991	Member Department of Medicine Fellowships Program Committee
1992	Member Hematology-Oncology Research Track Standards Committee
1993	Member Department of Medicine Faculty Tracks Committee
1994	Member Department of Molecular Biology & Microbiology Faculty Recruitment Committee
1995-	Member University Hospitals Committee on Familial Colon Cancer

1995	Member Dean's Committee on Tenure Policy
1996-1997	Member Dean's Committee on Technology Commercialization
1996-1997	Member University Patent Committee
1997-1998	Member Research Committee, CWRU School of Medicine
1997-1998	Member, Search Committee, Chairperson, Department of Biochemistry
1997-	CWRU Representative to American Society of Clinical Investigators
1998-	Reviewer of CWRU Cancer Center Cores
2001-2002	Co-Chair, Search Committee for Chairperson, Department of Genetics
2003-2004	Chair, Search Committee for Chairperson, Department of Pathology

#### Institutional Programs

09/90-10/90	Member CWRU Research Building Oncology Task Force
1991-1994	Internal Grant Reviewer for CWRU VA
1994	Member University Hospitals Interdepartmental Colon Cancer Clinical Guidelines Task Force Case Western Reserve University – Ireland Cancer Center
1991-1996	Member Ireland Cancer Center Grants Review Committee
06/95-	Head Program in Cancer Genetics
1995-	Member Executive Committee CWRU Cancer Research Center
1995-1999	Co-Director, Program in Human Genetics and Genome Analysis

#### **EXTERNAL PROFESSIONAL SERVICE**

##### Federal Government:

12/03/90	Reviewer for NIH Small Business Grants Program
12/90,04/92,04/94	Reviewer for NIH Special Study Sections
01/91-06/97	Member NIH Metabolic Pathology Study Section ad hoc (1991--1993) full (1993--1997)
1990-1992	Special Review for VA RAGS and Merit Review
09/97	Member Search Committee, Laboratory of Chemoprevention, NCI
3/24/98	Ad Hoc Reviewer NCI Scientific Review Group Subcommittee H
9/99-2/00	Parent Committee, NCI Colon Cancer Progress Review Group
2001-	Member Advisory Board, NCI Cooperative Family Registries
2001-	Member NIH Specimen Resources Committee
2001-	Member NIH Special Grant Review Group

##### External Institutions

1998-99	Member Board of External Scientific Advisors, University of Pennsylvania Cancer Center
1999-2002	Board of Trustees – Ohio Cancer Research Associates
1999-	Member Board of Scientific Advisors, Abramson Family Cancer Research Institute at the University of Pennsylvania Cancer Center
1999-	Member, Scientific Advisory Board, National Colon Cancer Research Alliance
2001-	Member Strategic Plan Development Committee, American Society of Clinical Oncology

#### **EDITORIAL BOARDS:**

1999-	Clinical Cancer Research
2001-	Cancer Research

#### **MANUSCRIPT REVIEWER:**

- Journal of Cell Physiology

- Journal of Clinical Investigation
- Cancer Research
- Proceedings National Academy of Sciences USA
- Cell Growth and Differentiation,
- British Journal of Cancer
- Oncogene
- Clinical Cancer Research
- Gastroenterology
- Blood
- Science
- Genomics
- Cancer Cell
- Nature Genetics

**INVITED LECTURES:**

- |          |   |
|----------|---|
| 1992     | <u>National</u><br>"Molecular Biology of Colon Cancer"<br>Johns Hopkins University, Department of Pathology Seminar Series, Baltimore             |
| 1993     | "Molecular Biology of Colon Cancer"<br>MD Anderson Cancer Center, Departments of Cell Biology & Gastroenterology, Joint Seminar, Houston          |
| 1994     | "Molecular Biology of Colon Cancer"<br>Memorial Sloan Kettering Cancer Center, Department of Medicine Grand Rounds, New York                      |
| 1993     | "Advances in the Biology and Therapy of Colorectal Cancer" Co-Chair Session on Tumor Markers at MD Anderson                                       |
| 1994     | "Molecular Biology of Colon Cancer" Montefiore Hospital, Albert Einstein Cancer Center Seminar Series, NY   |
| 1994     | "Molecular Biology of Colon Cancer" Co-chair Session on Growth Factors, Annual Meeting of American Association for Cancer Research                |
| 1995     | "R11, A New Colon Cancer Suppressor Gene"<br>Symposium Speaker, Molecular Genetics of Cancer Clinical Research Meeting, ASCI, APCR AAP, San Diego |
| 1995     | "R11, A New Colon Cancer Suppressor Gene"<br>University of Pennsylvania, Division of Hematology-Oncology Seminar Series, Philadelphia             |
| 1995     | "R11, A New Colon Cancer Suppressor Gene"<br>National Cancer Institute, Laboratory of Chemoprevention Seminar Series, Bethesda                    |
| 01/13/96 | "R11, A New Colon Cancer Suppressor Gene"<br>National Cancer Institute Symposium: The Role of Cytokines in Cancer, Bethesda                       |
| 01/24/96 | "R11, A New Colon Cancer Suppressor Gene"<br>University of California at San Francisco, GI Grand Rounds, San Francisco                            |
| 05/15/96 | "R11, A New Colon Cancer Suppressor Gene"<br>Hershey Medical Center, Penn State University, Cell and Molecular Biology Program                    |
| 08/20/96 | "R11, Gene Mutations in Cancer Diagnosis and Therapy"<br>Transgene Biotechnology Co., Strasbourg, France.   |
| 09/18/96 | "R11, A New Colon Cancer Suppressor Gene"<br>University of California at San Francisco, Cancer Center Seminar Series, San Francisco               |
| 10/07/96 | Invited Participant. American Cancer Society Consensus Conference on Heritable Cancer Syndromes and Genetic Testing. Chicago.                     |

11/08/96	"Hypermutable and RII Mutations Define a Novel Pathway of Colon Carcinogenesis" Forbeck Foundation Symposium. Chair. Hilton Head, S.C.
01/02/97	"Hypermutable and TGF- $\beta$ receptor Mutations Create a Novel Pathway of Human Colon Carcinogenesis" Solid Tumor Conference, Memorial Sloan-Kettering Cancer Institute, New York
03/10/97	"Hypermutable and TGF- $\beta$ receptor Mutations Create a Novel Pathway of Human Colon Carcinogenesis" Vanderbilt University Symposium: What's New in Gastrointestinal Cancer, Nashville
3/19/97	"Hypermutable and TGF- $\beta$ receptor Mutations Create a Novel Pathway of Human Colon Carcinogenesis" Massachusetts General Hospital-Harvard Medical School-Cancer Center Seminar Series, Boston
3/27/97	"Hypermutable and TGF- $\beta$ receptor Mutations Create a Novel Pathway of Human Colon Carcinogenesis" University of Wisconsin Cancer Center-Department of Human Oncology Seminar Series, Madison
5/18/97	"DNA repair defects inactivate tumor suppressor genes and induce hereditary and sporadic colon cancers" 33rd annual meeting ASCO, Scientific Symposia, Denver
6/18/97	"Hypermutable and TGF- $\beta$ receptor Mutations Create a Novel Pathway of Human Colon Carcinogenesis" UICC Study Group Meeting: Mechanisms of Growth Factor and Hormone Insensitivity, Woods Hole, MA
7/13/97	Chair person for: "Repair as a determinant of drug sensitivity in experimental and clinical cancer" Gordon Conference on Chemotherapy, New London, New Hampshire
10/14/97	"Hypermutable and TGF- $\beta$ receptor Mutations Create a Novel Pathway of Human Colon Carcinogenesis" Duke University, Durham, NC
10/29/97	"Hypermutable and TGF- $\beta$ receptor Mutations Create a Novel Pathway of Human Colon Carcinogenesis" 50th Annual Symposium: Molecular Determinants of Cancer Metastasis M.D. Anderson Cancer Center, Houston, TX
11/22/97	"Hypermutable and TGF- $\beta$ receptor Mutations Create a Novel Pathway of Human Colon Carcinogenesis" Lemuel Herrera, Lecturer, Annual meeting of the North American Group on Inherited Colorectal Cancer, Cleveland, OH
2/26/98	"DNA repair defects inactivate tumor suppressor genes in hereditary and sporadic colon cancer." Presentation at Memorial Sloan Kettering Cancer Center Symposium "Novel therapeutic targets for the treatment of colon cancer." N.Y. N.Y.
3/29/98	"DNA repair genes and TGF- $\beta$ receptors, coupled targets in human colon carcinogenesis." Presentation at "Inherited Cancer susceptibility: Syndromes, Genetics, Genes and Function" Symposium of Annual Meeting of American Association for Cancer Research, New Orleans
4/05/98	"DNA repair genes and TGF- $\beta$ receptors, coupled targets in human colon carcinogenesis". Presentation at "Molecular and Genetic Approaches to Human Disease." Howard Hughes Medical Institute, Chevy Chase, MD
4/19/98	"DNA repair genes and TGF- $\beta$ receptors, coupled targets in human colon carcinogenesis." Presentation at Genetics Society of America Symposium "DNA repair: Bacteria to Humans." Airlie Conference Center, VA
5/19/98	"TGF-beta and its Receptors". Presentation at Annual Meeting American Gastroenterology Association, New Orleans, LA
5/28/98	"DNA repair genes and TGF- $\beta$ receptors, coupled targets in human

	colon carcinogenesis." Presentation at Albert Einstein College of Medicine Cancer Center, N.Y., N.Y.
7/08/98	"DNA repair genes and TGF- $\beta$ receptors, coupled targets in human colon carcinogenesis." Presentation at Molecular Biology in Clinical Oncology, An AACR Workshop, Aspen, CO
8/11/98	"DNA repair defects and TGF-beta receptor mutations define a novel pathway of colon carcinogenesis." Presentation at Gordon Conference on: DNA Alterations in Transformed Cells. Colby-Sawyer College, NH
10/29/98	"Methylation of DNA repair genes and coupled mutation of TGF-Beta receptor genes define a novel pathway of human colon carcinogenesis". Whitehead Institute Functional Genomics Seminar Series, MIT, Cambridge, MA
11/17/98	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." The 29 <sup>th</sup> International Symposium of the Princess Takamatsu Cancer Research Fund, Tokyo, Japan.
4/04/99	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." Molecular Mechanisms of Gastrointestinal Cancers, Keystone, CO
4/13/99	"TGF-Beta and Colon Cancer". "Meet the Expert" Talk; AACR Annual Meeting, Philadelphia, PA
5/18/99	"DNA repair defects inactivate tumor suppressor genes and induce hereditary and sporadic colon cancers", Presentation at 35 <sup>th</sup> Annual ASCO meeting. Atlanta, GA
9/20/99	"TGF-Beta receptor defects in human cancer", 3 <sup>rd</sup> International conference on TGF- $\beta$ . Bethesda, MD
12/1/99	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." Visiting Professor, Gastrointestinal Grand Rounds, University of California, San Francisco.
12/2/99	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." Visiting Professor, Gastrointestinal Grand Rounds, Genentech Inc., San Francisco.
1/17/00	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." Gordon Research Conference: Cancer Genetics and Epigenetics, Ventura, Ca
1/28/00	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." Grand Rounds of the Ohio State University Comprehensive Cancer Center, Columbus, OH
3/16/00	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." Grand Rounds of the University of Pittsburgh Comprehensive Cancer Center, Pittsburgh, PA
4/5/00	"DNA mismatch repair and TGF-beta receptors, coupled targets in human colon cancer." Presentation at the 91 <sup>st</sup> Annual AACR meeting, San Francisco, CA
4/24/00	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." HHMI-NIH Research Scholars Seminar Series, HHMI-NIH Cloister, Bethesda MD
5/21/00	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." Presentation at 36 <sup>th</sup> Annual ASCO meeting, New Orleans, LA
10/28/00	"Pathways of Gastrointestinal Neoplasia." Symposium: Modeling Human Colorectal Cancer in Mice, Jackson Laboratories, Bar Harbor, Maine
12/7/00	"DNA mismatch repair and TGF-beta receptors, coupled targets in human colon cancer." Yale University Comprehensive Cancer Center, New Haven, CT



1/30/01	"Pathways of Gastrointestinal Neoplasia." Keynote lecture, Keystone Symposium: The Molecular Medicine of Colorectal Cancer, Taos, NM
3/28/01	"Pathways of Gastrointestinal Neoplasia." Symposium Presentation at the 92 <sup>nd</sup> Annual AACR meeting, New Orleans, LA
3/28/01	Symposium Chair: Colon Cancer: The Molecular View at the 92 <sup>nd</sup> Annual AACR meeting, New Orleans, LA
3/30/01	"Pathways of Gastrointestinal Neoplasia", Invited Speaker, Graduate Student Symposium, Cell and Molecular Biology Program, Duke University, Durham, N.C.
4/17/01	"Pathways of Gastrointestinal Neoplasia." Petros Palandjian Visiting Professor, Harvard Medical School, Massachusetts General Hospital, Boston, MA
4/18/01	"Pathways of Gastrointestinal Neoplasia.", Petros Palandjian Visiting Professor, Harvard Medical School, Dana-Farber Cancer Institute, Boston, MA
6/14/01	"Pathways of Gastrointestinal Neoplasia", Invited Speaker: Wisconsin Symposium 2: The analysis of human biology: genes, genomes and molecules, Madison, WI
7/11/01	"Pathways of Gastrointestinal Neoplasia", Roswell Park Cancer Institute, Buffalo, NY
9/10-14/01	American Co-Chair of AACR International Conference Seoul 2001: Molecular Mechanisms of Gastrointestinal Cancer Development and its Clinical Implications, Seoul, Korea
9/14/01	Pathways of Gastrointestinal Neoplasia, AACR International Conference Seoul, Korea
3/14/02	Pathways of Gastrointestinal Neoplasia". U. C. San Francisco. San Francisco, CA.
3/15/02	Pathways of Gastrointestinal Neoplasia". Eos Biotechnology, Inc. South San Francisco, CA.
4/7/02	Symposium Chair: Forum: The Best Targets in Colon Cancer. 93 <sup>rd</sup> annual AACR meeting. San Francisco, CA
4/7/02	Novel Molecular Targets in Colon Cancer. Forum presentation at the 93 <sup>rd</sup> annual AACR meeting. San Francisco, CA
5/31/02	"Genetic Targets in Colon Cancer". University of Michigan Cancer Center Grand Rounds. Ann Arbor, MI
6/29/02	Chairperson: Symposium of Comprehensive Molecular Analysis. 2 <sup>nd</sup> NCI-EORTC International Meeting on Cancer Diagnostics, Washington, D.C.
6/29/02	"Target Identification in Colon Cancer". 2 <sup>nd</sup> NCI-EORTC International Meeting on Cancer Diagnostics, Washington, D.C.
9/4/02	"Target Identification in Colon Cancer". G.I. Collaborative Group of the N.C.I. Early Detection Network, 6 <sup>th</sup> Annual Meeting. Ann Arbor, MI.
6/3/03	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." Presentation at 39 <sup>th</sup> Annual ASCO meeting, Chicago, IL
7/14/03	Co- Chair: Forum: New Directions in Colon Cancer. 94 <sup>th</sup> annual AACR meeting. Washinton, DC
7/14/03	New Genetic Insights in Colon Cancer. Forum presentation at the 94 <sup>th</sup> annual AACR meeting. Washington, DC
8/18/03	"Genes that Cause Colon Cancer in Man". University of Michigan, Department of Medicine, Ann Arbor, MI
4/14/04	Genes that Cause Cancer in Man, University of Pennsylvania Cancer Center, Philadelphia, PA

Local

1988	"Molecular Biology of Colon Cancer" North East Ohio Association Clinical Oncology, Cleveland
1989	"Molecular Biology of Colon Cancer" Elyria Memorial Hospital CME Rounds, Elyria
1989	"Molecular Biology of Colon Cancer" Cleveland Clinic Research Institute, Immunology & Cancer Division, Cleveland
1991,1995	"Molecular Biology of Colon Cancer" Cleveland Clinic Research Institute, Molecular Biology Division, Cleveland
1990	"Molecular Biology of Colon Cancer" Euclid General Hospital Grand Rounds, Euclid
1993	"Molecular Biology of Colon Cancer" Cleveland Clinic Research Institute, Cleveland
1994	"Molecular Biology of Colon Cancer" Aultman Memorial Hospital Grand Rounds, Canton
2000	"DNA repair genes and TGF-beta receptors, coupled targets in human gastrointestinal cancers." Lerner Research Insititute, Cleveland Clinic Foundation

Intramural

1988	Ireland Cancer Center CME Symposium: Focus on Colorectal Cancer
1989	Ireland Cancer Center Research Retreat
1989,1995	Division of Hematology, Blood Club
1989, 1992, 1994, 1998	Division of Gastroenterology, Grand Rounds
1989,1991,1995	Department of Medicine Medicine Today Series
1989,1991	Department of Medicine Faculty Research Presentation
1990,1991	Program in Cell Biology Research Retreat Speaker
1990	Department of Environmental Health Sciences Seminar Series
1990	Department of Genetics Seminar Series
1990,1994, 1997	Department of Medicine Grand Rounds
1991	Department of Surgery Grand Rounds
1991,1996	Department of Pathology Grand Rounds
1991	Immunology Rounds
1992	Department of Biochemistry Seminar Series
1995	Ireland Cancer Center Symposium: Colon Cancer, A Comprehensive Review
1995	Department of Molecular Biology and Microbiology
10/23/96	"Hypermutability and RII Mutations Define a Novel Pathway of Colon Carcinogenesis"
	Speaker, Department of Human Genetics, CWRU
10/25/96	"Hypermutability and RII Mutations Define a Novel Pathway of Colon Carcinogenesis"
	Division of Hematology-Oncology Retreat. CWRU
11/01/96	"Hypermutability and RII Mutations Define a Novel Pathway of Colon Carcinogenesis"
	Department of Medicine Biomedical Research Seminar Series, CWRU
4/24/97	"Why It Matters Where You Buy Your Genes", Amicae Medicinae, CWRU
10/22/97	"Genes That Cause Colon Cancer in Man", Invited Lecture, School of Medicine, CWRU
5/24/99	"Genes That Cause Colon Cancer in Man", Presentation, Oncology Training Grant Seminar Series.
12/31/99	"Genes That Cause Colon Cancer in Man", Presentation to Department of Clinical Pathology, University Hospitals of Cleveland

5/10/00	"Genetic Causes of Colon Cancer in Man", Presentation to CWRU "Mini-Medical School"
10/17/03	"Genes that Cause Colon Cancer in Man", Presentation at dedication of the Wollstein Research Building

**RESEARCH SUPPORT:**

**Active**

**1. *TGF- $\beta$  Receptor Super Family Members Function in Cancer***

S. Markowitz, Investigator, 10% effort  
Howard Hughes Medical Institute

5/03 – 9/08

Dr. Markowitz salary and benefits and those of 2 postdoctoral associates, 3 technical assistants, and an Administrative assistant, are paid by their employer, the Howard Hughes Medical Institute. For the 2004-2005 funding year, the Institute is additionally providing \$351,00 for laboratory operations.

**2. *Novel Mutator Phenotypes Important in Human Colon Cancer***

S. Markowitz, Principal Investigator, 20% effort  
NIH R01 CA 67409  
\$361,644 current annual direct cost

04/11/01-01/31/06  
\$1,644,524 total direct cost

**3. *Susceptibility Genes for Human Colon Neoplasia***

S. Markowitz, Principal Investigator, 15% effort  
NIH U01 CA82901  
\$745,531 annual direct cost

09/30/99-08/31/04  
\$ 3,304,666 total direct cost

**4. *Gene Expression of Colon Cancers that Metastasize***

"Directors Challenge" Project Award  
S. Markowitz, Principal Investigator, 15% effort  
NIH U01 CA88130  
\$1,226,419 annual direct cost

08/30/00-1/31/2005  
\$5,447,687 total direct cost

**5. *Genetics of Gastrointestinal Cancers***

Ohio Board of Regents, Biomedical Research  
Transfer Trust (BRTT)  
J. Nadeau, P.I.; S. Markowitz Project Leader  
S. Markowitz, Project Leader  
02-004

05/01/03-04/30/06  
\$313,000 year 1 project costs Technology  
\$939,000 cumulative project 1 costs  
\$3,083,040, year 1 total grant award  
\$10,200,000, cumulative total grant BRTT  
award

**6. *CWRU Cancer Research Center Core Grant***

S. Markowitz, Program Leader, 5% effort  
NIH P30 CA 43703  
Program 4, Cancer Genetics  
\$3,834,161 total annual direct core grant cost

J.K.V. Willson, P.I.  
8/01/96 - 07/31/2006  
\$22,780 for program 3  
\$19,672,659 total direct grant cost

**7. *Markers of Colon Cancer Risk***

07/01/2000 - present

S. Markowitz P.I.  
Grant from the National Colon Cancer Research Alliance

\$167,000 current year award costs  
\$847,881 cumulative award costs

**8. *Serologic Markers of Colon Cancer***

Project Awarded Within the NIH Early Detection  
Research Network (EDRN) Program  
S. Markowitz Project Leader  
D. Sidransky, P.I.

10/01/03-09/30/05  
\$50,000 year 2 project costs  
\$100,000 total direct project award

9. ***Genetic Determinates of Human Colon Neoplasia***  
S. Markowitz, Mentor  
1K23CA81308  
\$125,000 annual direct cost  
G. Wiesner, Principal Investigator  
04/01/99 - 03/31/04  
\$625,000 total direct cost
10. ***GRP78 and Hypersensitivity to DNA Cross-Linking Agents.***  
S. Markowitz, Co-Mentor  
K01-CA79087  
\$108,000 annual direct cost  
C. Belfi, Principal Investigator  
04/00-03/05  
\$741,330 total direct cost
11. ***The "Great" System to Identify Familial Cancer Risk***  
S. Markowitz, Co-Mentor  
K07 CA-86958-01  
\$121,500 annual direct cost  
L. Acheson, Principal Investigator  
9/1/00-8/31/05  
\$607,500 total direct cost
12. ***Models for the Molecular Classification of Tumors***  
S. Markowitz, Mentor  
K25 CA-89867-01  
139,000 annual direct costs  
J. S. Rao, Principal Investigator  
6/01-5/06  
\$695,556 total direct cost
13. ***Interaction of Diet and Susceptibility Genes in Colorectal Neoplasia***  
S. Markowitz, Mentor  
Damon Runyon-Walter Winchell Foundation Award  
Total direct award  
Li Li, Principal Investigator  
07/01/01-06/30/06  
\$995,000 total direct cost

**Pending**

1. ***A9q22.2 Gene is a Novel Cause of Familial Colon Cancer***  
S. Markowitz, P.I., 15%  
NIH RO1  
\$1,106,160 annual direct costs  
04/01/2005 – 03/31/2010  
\$5,484,901 – Total direct cost

**Past**

1. ***TGF- $\beta$  Receptor Gene Mutations Detected in Human Cancer***  
S. Markowitz, Principal Investigator, 20% effort  
NIH R01 CA 72160  
\$1,533,188 total direct cost  
09/1/96 - 06/30/2002
2. ***Transforming Functions of Mutant Colon Cancer Oncogenes***  
S. Markowitz, Principal Investigator  
NIH R01 CA 57208-01  
\$534,515 total direct cost  
07/92 - 04/96
3. ***Novel Oncogene Product Detected in Human Colon***  
S. Markowitz, Principal Investigator  
NIH Award R29 CA 51504  
\$338,992 total direct cost  
12/89 - 11/94
4. ***Role of Mutant ras and p53 Oncogenes in Human Colon Carcinogenesis***  
S. Markowitz, Principal Investigator  
American Cancer Society, Cuyahoga County, Pilot Research Grant  
\$13,646 total direct cost  
07/01/90 - 06/30/91
5. ***Role of Mutant p53 Alleles in Determining Clinical Drug Resistance of Colon***

***Cancer to 5-FU Based Chemotherapy***

S. Markowitz, Principal Investigator

American Cancer Society, Cuyahoga County, Pilot Research Grant

\$13,646 total direct cost

12/01/94 - 11/30/95

**6. *Novel Markers of Colon Cancer Progression***

S. Markowitz, Principal Investigator

Ohio Cancer Research Associates

\$18,000 annual direct cost

09/94 - 08/96

\$36,000 total direct cost

**7. *Altered Gene Expression in Alkylating Agent Resistant Human Colon Cancer***

Project in: Modulating of Alkylating Agent Chemotherapy in Colon Cancer

S. Markowitz, Project Leader, 25% effort

NIH Award P01 CA 51183

\$90,800 annual direct cost through 11/95

\$10,000 extension through 2/97

N. Berger, Principal Investigator

12/90 - 11/96

\$ 399,569 total direct project cost

\$3,365,938 total direct program cost

**8. *Mutant and Newly Expressed Genes in Colon Cancer***

S. Markowitz, Principal Investigator

ACS Faculty Research Award (Salary Award),

FRA-451

\$41,000 annual direct cost

07/94 - 02/98

\$205,000 total direct cost

**9. *Program in Human Cancer Genetics and Genome Analysis***

S. Markowitz, Co-Director

(A. Chakravarti, Co-Director)

State of Ohio, Board of Regents Challenge Fund

\$250,000 annual direct costs

07/01/96 - 12/30/98

\$500,000 total direct costs

**10. *Susceptibility Genes for Human Colon Neoplasia***

Genetic Research Supplement to CWRU P30 Core Grant

S. Markowitz, Project Leader, 10% Effort

Supplement to N.I.H. P30CA 43703

J.K.V. Willson, P.I.

09/30/96 – 07/31/99

\$374,526 total direct cost

**11. *RII Tumor Suppressor Gene Inactivation in Human Prostate Cancer***

S. Markowitz, Principal Investigator, 1% effort

Capcure

12/15/96 - 11/30/99

\$100,000 total direct costs

12/01/97 – Present

\$75,000 total direct costs

**ACADEMIC TEACHING:**

Medical Students

1987

Seminar in Elective #02-010, Oncogenes in Normal & Neoplastic Cells

1988-1991

Annual lecture in case-oriented problem-solving--Oncology Section

1988

Preceptor in research elective for Ms. Giselle Smith

1989

Sponsor Silber Summer Research Fellowship for Giselle Smith

07/92

Preceptor in outpatient clinic A rotation for Ms. Susan Lord

12/92

Preceptor in outpatient clinic A rotation for Ms. Rebekah Chapnick

1993

Seminar in Elective Hematology 001: Human Carcinogenesis

1/93-2/94

Taught section in PD3, Physical Diagnosis

4/94

Participant in panel discussion on career choices in internal medicine

5/94, 05/95, 5/97

Lecturer in GI Section, First-Year Core Curriculum

1997-1998

Research Elective in Hematology 9001 for Mr. Aditya Pandey, class 2001

6/98-8/98

ADHF Summer research fellowship for Mr. Aditya Pandey

6/01-8/01	Silber Summer research fellowship for Mr. Clifford Robinson
6/01-8/01	Silber Summer research fellowship for Ms. Linda Faulk
9/01-12/01	MISC 3090 Research Elective, Ms. Linda Faulk
10/03-6/04	DAAD (German Academic Exchange Service) Research Student Fellow, Matthias Christgen

Graduate Students

1991	Speaker in MB10476: "Oncogenes Meet Anti-Oncogenes" 2 hours lectures
1992	Speaker in EVHS 510: Molecular Oncology A 4 hours lectures
1992	Speaker in Genetics 504: Advanced Eukaryotic Genetics 3 hours lectures
1992	Organized, solo taught MBIO 451b: Molecular Biology of Human Cancer A 18 hours lectures & seminar
1995, 1997, 1999, 2002	Co-taught MBI0 420: Molecular Genetics of Cancer A 14 hours lectures
1996, 1997	Speaker in Molecular Biology and Cell Biology Training Program Wednesday Morning Series A 1 hour of lectures
2003	Speaker in Statistics 473: Statistical Methods for the Analysis of DNA Microarray Data, 2 hours of lectures

Undergraduate Students

1994	Preceptor in Biology 388, undergraduate research elective, Ms. Sandra Swinler
1996	Howard Hughes Summer Student, Ms. Kim Yonkof, Notre Dame Univ.
1997	Rakhee Palekar, Summer Student, Wellesley College
1997	Mariesa Chartrant, Summer Student, Notre Dame College
1998	Howard Hughes Summer Student, Aaron Clark, Case Western Reserve University
1999	Howard Hughes Summer Student, Melissa Hull, University of Richmond
1999	Summer work experience, Bruce Willson, Antioch College
1999	Howard Hughes Summer Student, Ruth Gerson, Harvard College
9/01-6/02	Eric Greer, Case Western Reserve Undergraduate Research Elective BIOC 391

**CLINICAL TEACHING:**

Fellows, House Staff, Medical Students

1988-1996	Solid Tumor Service Attending, 1 month annually, includes 12 hours didactic lectures monthly
1988-1994	Attending Hematology-Oncology Consult Service, 1 month annually, includes 20 hours didactic lectures monthly
03/89,03/90,11/90	Attending at Department of Medicine Morning Report
1988-1996	Annual Lecturer in Medicine House Staff Wednesday Educational Series Numerous case discussions at Medicine Mortality & Morbidity Conference
1988-1990	Preceptor in Outpatient Oncology Clinic for Dr. Mitchell Haut
1989	Staff Research Day Awards Committee
1991	Sponsor research elective for Dr. Greg Cooper
1991-1994	Preceptor in Outpatient Oncology Clinic for Dr. James Sabiers
03/97	Preceptor in Outpatient Oncology Clinic for Dr. Tim O'Brien
1998	Scientific Teaching Excellence Award, Division of Hematology-Oncology, Case Western Reserve University
Research Elective Shuji Ogino, M.D., Department of Pathology, CWRU	
1999-current	Oncology Lecture Series to Solid Tumor Service Housestaff

Faculty Mentored Research

2001-	Li Li, M.D., Damon Runyon Award Co-Mentee, Assistant Professor, Department of Family Medicine
2001-2005	Sunil Rao, Ph.D., K25 Mentee, Assistant Professor, Department of Epidemiology and Biostatistics (selected for funding for 6/1 start)
1999-2004	Georgia Wiesner, M.D., K23 Mentee, Assistant Professor, Department of Genetics, Case Western Reserve University.
2000-2005	Charles Belfi, Ph.D., K01 Co-Mentee, Assistant Professor, Department of Medicine, Case Western Reserve University
2000-2005	Louis Acheson, M.D., K07 Co-Mentee, Assistant Professor, Department of Family Medicine, Case Western Reserve University
1999-2000	William Grady, M.D., K08 Mentee, Assistant Professor, Department of Medicine, Case Western Reserve University. Currently Assistant Member, Division of Clinical Research, Fred Hutchinson Cancer Center).
1996-1997	James Eshleman, M.D., Ph.D., K08 Mentee, Instructor, Department of Pathology, Case Western Reserve University. Currently Assistant Professor, Department of Pathology, Johns Hopkins University

Postdoctoral Research Fellows

1988-1990	Mitchell Haut, M.D., Postdoctoral Fellow, Oncology Division (currently in clinical practice)
1990-1996	Lois Myeroff, Ph.D., Postdoctoral Fellow, (currently Instructor, Case Western Reserve University, Cancer Center)
1995-1997	James Eshleman, M.D., Ph.D. Instructor, Department of Pathology (currently Assistant Professor, Department of Pathology, Johns Hopkins University)
1995- 1998	Ashwani Rajput, M.D., Postdoctoral Fellow, Department of Surgery, Case Western Reserve (currently Assistant Professor, Department of Surgery, SUNY Buffalo)
1996- 1998	William Grady, M.D., Postdoctoral Fellow, Department of Medicine, Case Western Reserve University, Gastroenterology Division (currently Assistant Member, Division of Clinical Research, Fred Hutchinson Cancer Center).
1997-	Petra Platzer, Ph.D., Postdoctoral Fellow
1997-	Wei-dong Chen, M.D., Postdoctoral Fellow (currently Instructor, Case Western Reserve University, Department of Medicine, Hematology/Oncology Division.
1997-	Steven Fink, Ph.D., Postdoctoral Fellow
1998-2000	Weiqiang Zhao, Ph.D., Postdoctoral Fellow (currently Pathology Resident, Tulane University)
1998-	Helen Moinova, Ph.D., Postdoctoral Fellow
1999-2003	Shi-Long Lu, Ph.D., Postdoctoral Fellow (currently Assistant Professor, University of Oregon)
1999-2003	Elaine Brunschweig, Ph.D., Postdoctoral Fellow (currently teaching faculty Cuyahoga County Community College)
2001- 2004	Christine Ticknor, Ph.D., Postdoctoral Fellow
2001-	Baozhong Xin, Ph.D., Postdoctoral Fellow
2001-	Joel Saltzman, M.D., Postdoctoral Fellow
2002-	Hui Xiao, Ph.D., Postdoctoral Fellow
2003-	Jerome Sah, Ph.D., Postdoctoral Fellow
2003-	Laura Nadaeu, M.D., Postdoctoral Fellow
2004-	Kishore Guda, Ph.D., Postdoctoral Fellow
2004-	Seung-Jae Myung, M.D., Ph.D., Postdoctoral Fellow
2004-	Revital Kariv, M.D., Postdoctoral Fellow

Graduate Students

#### Thesis Advisor

1990-1996	Ph.D. Thesis Advisor for <u>Mr. Bin Yang</u> , Department of Molecular Biology & Microbiology. Ph.D. 6/96. Currently Pathology Resident, Cleveland Clinic Foundation, 7/96 -
1992-1997	Ph.D. Thesis Advisor for <u>Ms. June Traicoff</u> , Department of Molecular Biology & Microbiology. Ph.D. 10/97. Currently Postdoctoral Fellow, NIH.
1997-2000	M.S. Thesis Advisor for <u>Ms. Hongmei He</u> , Department of Molecular Biology & Microbiology, currently researcher at University California San Diego
1997-2003	Ph.D. Thesis Advisor for <u>Mr. Josh Friedman</u> , MSTP Student, Department of Genetics. Currently completing MD studies, CWRU
4/1999-7/2003	Ph.D. Thesis Advisor for <u>Mr. Hui Li</u> , BSTP Student, Department of Molecular Biology and Microbiology (currently Postdoctoral Fellow, Yale University)
3/2000-	Ph.D. Thesis Advisor for <u>Mr. Min Yan</u> , BSTP Student, Department of Molecular Biology and Microbiology
1/2003-	Ph.D. Thesis Advisor for <u>Ms. Yali Li</u> , BSTP Student, Department of Molecular Biology and Microbiology
1/2003-	Ph.D. Thesis Advisor for <u>Mr. Chunguang Guo</u> , BSTP Student, Department of Molecular Biology and Microbiology
1994- 1997	Ph.D. Thesis Committee member for <u>Mr. Priit Kogerman</u> , Department of Molecular Biology & Microbiology
1994-1996	Ph.D. Thesis Committee member for <u>Ms. Jing Wang</u> , Department of Molecular Biology & Biochemistry, Medical College of Ohio (M Brattain, Advisor). Ph.D. 6/96. Postdoctoral Fellow with David Beach, Cold Spring Harbor Laboratories, 7/96
1995	Chairman of Ph.D. Thesis Committee for <u>Mr. Feng He</u> , Department of Molecular Biology & Microbiology (HJ Kung, L Culp, Advisors). Deceased
1995-1997	Ph.D. Thesis Committee member for <u>Amy Wandstrat</u> , Department of Genetics (S Schwartz, Advisor). Postdoctoral Fellow, Texas Southwestern
1996-1999	Ph.D. Thesis Committee member for <u>Mr. Min Sun</u> , Department of Pathology (O. Sudilovsky, Advisor), Student currently in training
1997-1999	Ph.D. Thesis Committee member for <u>Gregory Riely</u> , Department of Pathology (M. Tykocinski, Advisor).
1997-2000	Ph.D. Thesis Committee member for <u>Mark Paris</u> , Department of Genetics, (B. Williams, Advisor) :
1997-2001	Ph.D. Thesis Committee member for <u>Lori Hughes</u> , Department of Genetics, (G. Stark, Advisor)
2001-2001	Ph.D. Thesis Committee member for Minerva Carrasquillo, Department of Genetics (A. Chakravarti, Advisor)
2004-	Ph.D. Thesis Committee member for Wendilorian Morgan Department of Genetics, (Georgia Wiesner, Advisor)

#### Laboratory Research Rotations

1991	Lynn Horton, BSTP student
1993	Robert Schiavone, BSTP student
1994	Naalla Sirota, MSTP student
1995	Paula McKinney, BSTP student
1995	Joseph Spoonster, BSTP student
1996	Mark Paris, BSTP student
1996	Hongmei He, BSTP student
1996	Maria Bamberger, BSTP student
1997	Tao Pan, BSTP student
1998	Aaron Neuman, BSTP student
1998	Jamel Johnson, BSTP student



1999	Michelle Holko, BSTP student
1999	ShaoDong Liu, BSTP student
1999	Tianbing Liu, BSTP student
1999	Hui Li, BSTP student
1999	Min Yan, BSTP student
2000	Jason Ospina, BSTP student
2001	Marta Taddeo, BSTP student
2002	David Shultz, MSTP student
2002	Lei Sun, Molecular Biology and Microbiology student
2002	Collen McGannon, BSTP student
2002	Yali Li, BSTP student
2002	Chunguang Guo, BSTP student
2002	Jiayi Yang, BSTP student
2002	Yuan Lin, BSTP student
2003	Yiping Rong, BSTP student

#### Training Grant Participation

1994-	Oncology Postdoctoral Training Grant (C. Distelhorst, Director)
1996-	Cell and Molecular Biology Predoctoral Training Grant (F. Rotman, Director)
1997-	Immunology Predoctoral Training Grant (M. Lamm, Director)
1997-	Genetics Training Grant (Terry Hassold, Director)
1997-	Physicians Research Training Grant, CWRU Cancer Center (C. Distelhorst, Director)
1997-	Medical Scientist Training Program Grant (J. Nilson, Director)

#### **PUBLICATIONS:**

##### Peer Reviewed

1. Markowitz S, Marchesi VT: The carboxyl-terminal domain of human erythrocyte band 3: description, isolation and location in the bilayer. *J Biol Chem* 256: 6463-6468, 1981.
2. Melnick D, Nauseef W, Markowitz S, Gardner J, Malech H: Biochemical analysis and subcellular localization of a neutrophil specific antigen, PMN-7, involved in the respiratory burst. *J Immunol* 134: 3346-3355, 1985.
3. Todd MB, Malech HL, Waldron JA, Jennings KJ, Rome LS, Markowitz SD, Holford TR, Gardner JP, Wolak JP: Loss of myeloid differentiation antigens is correlated with impending blast transformation in chronic myelogenous leukemia. *Blood* 70: 122-131, 1987.
4. Markowitz S, Krystal G, Lebacqz-Verheyden A, Way J, Sausville E, Battey J: Transcriptional activation and DNase I hypersensitive sites are associated with selective expression of the gastrin-releasing peptide gene. *J Clin Invest* 82: 808-815, 1988.
5. Battey JF, Labacqz-Verheyden AM, Krystal G, Markowitz S, Sartor O, Way J: Regulation of the expression of human pre-progastrin-releasing peptide gene and post-translational processing of its gene product. *Ann NY Acad Sci* 547: 30-40, 1988.
6. Markowitz S, Haut M, Stellato T, Gerbic C, Molkentin K: Expression of the ErbA-Beta class of thyroid receptors is selectively lost in human colon carcinoma. *J Clin Invest* 84: 1683-1687, 1989.
7. Markowitz S, Molkentin K, Gerbic, Jackson J, Stellato T, Willson J: Growth stimulation by coexpression of transforming growth factor-alpha and epidermal growth factor receptor in normal and adenomatous human colon epithelium. *J Clin Invest* 86: 356-362, 1990.
8. Baker S, Markowitz S, Fearon E, Willson J, Vogelstein B: Wild-type p53 suppresses the growth of human colorectal carcinoma cells. *Science*. 249: 912-915, 1990.
9. Baker S, Preisenger A, Jessup J, Paraskeva C, Markowitz S, Willson J, Hamilton S, Vogelstein B: p53 gene mutations occur in combination with 17p allelic deletions as late events in colorectal tumorigenesis. *Cancer Res* 50: 7717-7722, 1990.
10. Haut M, Steeg P, Willson J, Markowitz S: Nm23 gene expression is induced in human colonic neoplasms and is equal in colon tumors of both high and low metastatic potential. *J Natl Cancer Inst* 83: 712-716, 1991.

11. Myeroff L, Markowitz S: Colon carcinomas of both high and low metastatic potential demonstrate increased expression and the absence of mutations in the nm23-H1 and nm23-H2 genes. *J Natl Cancer Inst* 85: 147-152, 1993.
12. Smith K, Johnson K, Bryan T, Hill D, Markowitz S, Willson J, Paraskeva C, Petersen G, Hamilton S, Vogelstein B, Kinzler K: The APC gene product in normal and tumor cells. *Proc Natl Acad Sci (USA)* 90: 2846-2850, 1993.
13. Leach F, Elledge S, Sherr C, Willson J, Markowitz S, Kinzler K, Vogelstein B: Amplification of cyclin genes in colorectal carcinomas. *Cancer Res* 53: 1986-1989, 1993.
14. Markowitz SD, Myeroff L, Cooper MJ, Traicoff J, Kochera M, Lutterbaugh J, Swiriduk M, Willson JKV: A benign cultured colon adenoma bears three genetically altered colon cancer oncogenes, but progresses to tumorigenicity and transforming growth factor-beta independence without inactivating the p53 tumor suppressor gene. *J Clin Invest* 93: 1005-1013, 1994.
15. Pietenpol JA, Papadopoulos N, Markowitz S, Willson JKV, Kinzler KW, Vogelstein B: Paradoxical inhibition of solid tumor cell growth by bcl2. *Cancer Res* 54: 3714-3717, 1994.
16. Liu B, Parsons RE, Hamilton SR, Peterson GM, Lynch HT, Watson P, Markowitz S, Willson JKV, Green J, de la Chappelle A, Kinzler KW, Vogelstein B: hMSH2 mutations in hereditary non-polyposis colorectal cancer kindreds. *Cancer Res* 54: 4590-4594, 1994.
17. Jen J, Harper JW, Bigner SH, Papadopoulos N, Markowitz S, Willson JKV, Kinzler KW, Vogelstein B: Deletion of *p16* and *p15* genes in brain tumors. *Cancer Res* 54: 6553-6558, 1994.
18. Liu B, Nicolaides NC, Markowitz S, Willson JKV, Parsons RE, Jen J, Papadopoulos N, Peltomäki P, de la Chappelle A, Hamilton S, Kinzler K, Vogelstein B: Mismatch repair gene defects in sporadic colorectal cancers with microsatellite instability. *Nature Genet* 9: 48-55, 1995.
19. da Costa LT, Liu B, El-Deiry WS, Hamilton SR, Kinzler KW, Vogelstein B, Markowitz S, Willson JKV, de la Chappelle A, Downey K, So A: Polymerase  $\delta$  variants in RER colorectal tumours. *Nature Genet* 9: 10-11, 1995.
20. Eshleman JR, Lang EZ, Bowerfind GK, Parsons R, Vogelstein B, Willson JKV, Veigl ML, Sedwick WD, Markowitz S: Increased Mutation rate at the *hprt* locus accompanies microsatellite instability in colon cancer. *Oncogene* 10: 33-37, 1995.
21. Markowitz S, Hines JD, Lutterbaugh J, Myeroff L, Mackay W, Gordon N, Rustum Y, Luna E, Kleinerman J: Mutant *K-ras* oncogenes in colon cancers do not predict patient's chemotherapy response or survival. *Clin Cancer Res* 1: 441-445, 1995.
22. Markowitz S, Wang J, Myeroff L, Parsons R, Sun L, Lutterbaugh J, Fan RW, Zborowska E, Kinzler KW, Vogelstein B, Brattain M, Willson JKV: Inactivation of the type II TGF- $\beta$  receptor in colon cancer cells with microsatellite instability. *Science* 268: 1336-1338, 1995.
23. Papadopoulos N, Nicolaides NC, Liu B, Parsons R, Lengauer C, Palombo F, D'Arrigo A, Markowitz S, Willson JKV, Kinzler KW, Jiricny J, Vogelstein B: Mutations of GTBP in genetically unstable cells. *Science* 268: 1915-1917, 1995.
24. Wang J, Sun L, Myeroff L, Wang X, Gentry LE, Yang J, Liang J, Zborowska E, Markowitz S, Willson JKV, Brattain MG: Demonstration that mutation of the type II Transforming Growth Factor- $\beta$  receptor inactivates its tumor suppressor activity in Replication Error-positive colon carcinoma cells. *J Biol Chem* 270: 22044-22049, 1995.
25. Wang CY, Eshleman JR, Willson JKV, Markowitz S: Both Transforming Growth Factor- $\beta$  and substrate release are inducers of apoptosis in a human colon adenoma cell line. *Cancer Res* 55: 5101-5105, 1995.
26. Riggins GJ, Markowitz S, Willson JK, Vogelstein B, Kinzler K: Absence of secretory phospholipase A<sub>2</sub> gene alterations in human colorectal cancer. *Cancer Res* 55: 5184-5186, 1995.
27. Parsons R, Myeroff LL, Liu B, Willson JKV, Markowitz SD, Kinzler KW, Vogelstein B: Microsatellite instability and mutations of the TGF- $\beta$  type II receptor gene in colorectal cancer. *Cancer Res* 55: 5548-5550, 1995. (SM corresponding author)
28. Myeroff LL, Parsons R, Kim S-J, Hedrick L, Cho KR, Orth K, Mathis M, Kinzler KW, Lutterbaugh J, Park K, Bang Y-J, Lee HY, Park J-G, Lynch HT, Roberts AB, Vogelstein B, Markowitz SD: A TGF-beta receptor type II gene mutation common in colon and gastric but rare in endometrial cancers with microsatellite instability. *Cancer Res* 55: 5545-5547, 1995.
29. Eshleman JR, Markowitz SD, Donover PS, Lang EZ, Lutterbaugh JD, Li G-M, Longley M, Modrich P, Veigl ML, Sedwick WD: Diverse hypermutability of multiple expressed sequence motifs present in a cancer with microsatellite instability. *Oncogene* 12:1425-1432, 1996.

30. Thiagalingam S, Lisitsyn NA, Hamaguchi M, Wigler MH, Willson JKV, Markowitz SD, Leach FS, Kinzler KW, Vogelstein B: Evaluation of the *FHIT* gene in colorectal cancers. *Cancer Res.* 56:2936-2939, 1996.
31. Thiagalingam S, Lengauer C, Leach F, Schutte M, Hahn S, Overhauser J, Willson JKV, Markowitz S, Hamilton S, Kern SE, Kinzler KW, Vogelstein B: Evaluation of candidate tumour suppressor genes on chromosome 18 in colorectal cancers. *Nature Genet.* 13:343-346, 1996.
32. Riggins GJ, Thiagalingam S, Rozenblum E, Weinstein CL, Kern SE, Hamilton SR, Willson JKV, Markowitz SD, Kinzler KW, Vogelstein B: *Mad*-related genes in the human. *Nature Genet.* 13:347-349, 1996.
33. Yang B, Stambrook PJ, Markowitz SD: Wild-type p53 demonstrates functional dominance in a human colon carcinoma cell line in which it induces reversible growth arrest. *Clin. Cancer Res.* 2: 1639-1647, 1996.
34. Yang B, Eshleman JR, Berger NA, Markowitz SD: Wild-type p53 protein potentiates cytotoxicity of therapeutic agents in human colon cancer cells. *Clin. Cancer Res.* 2: 1649-1657, 1996.
35. Huang J, Papadopoulos N, McKinley AJ, Farrington SM, Curtis LJ, Wyllie AH, Zheng S, Willson JKV, Markowitz SD, Morin P, Kinzler KW, Vogelstein B, Dunlop MG: *APC* mutations in colorectal tumors with mismatch repair deficiency. *Proc. Natl. Acad. Sci. (USA)* 93: 9049-9054, 1996.
36. Liu D, Pearlman E, Diaconu E, Guo K, Mori H, Markowitz S, Willson J, Sy M: Human tumor cells express a hyaluronidase gene which can induce angiogenesis in vivo. *Proc. Natl. Acad. Sci. (USA)*. 93:7832-7837, 1996
37. Liu L, Markowitz S, Gerson SL: Mismatch repair mutations override alkyltransferase in conferring resistance to temozolomide but not 1,3 bis(2-chloroethyl)nitrosourea. *Cancer Res.* 56:5375-5379, 1996.
38. Wu GS, Burns TF, McDonald ER III, Jinag W, Meng R, Krantz ID, Kao G, Gan D-D, Zhou J-Y, Muschel R, Hamilton SR, Spinner NB, Markowitz S, Wu G and El-Deiry WS: *Killer/DR5* is a DNA damage-inducible p53-regulated death receptor gene. *Nature Genet.* 17:141-143, 1997.
39. Phillips Jr W, Willson JKV, Markowitz S, Zborowska E, Zaidi N, Liu L, Gordon N, and Gerson S: *O*<sup>6</sup>-Methylguanine-DNA Methyltransferase (*MGMT*) transfectants of a 1,3-bis(2-chloroethyl)-1-nitrosourea (BCNU)-sensitive colon cancer cell line selectively repopulate heterogeneous *MGMT*<sup>+</sup>/*MGMT*<sup>-</sup> xenografts after BCNU and *O*<sup>6</sup>-benzylguanine plus BCNU. *Cancer Res.* 57: 4817-4823, 1997
40. Eshleman JR, Donover PS, Littman S, Swinler SE, Li G-M, Lutterbaugh JD, Willson JKV, Modrich P, Sedwick WD, Markowitz SD, and Veigl ML: Increased transversions in a novel mutator colon cancer cell line. *Oncogene.* 16:1125-1130, 1998.
41. Cahill DP, Lengauer C, Yu J, Riggins GJ, Willson JKV, Markowitz SD, Kinzler KW and Vogelstein B. Mutations of mitotic checkpoint genes in human cancers. *Nature.* 392:300-303, 1998.
42. Herman JG, Umar A, Polyak K, Graff JR, Ahuja N, Issa J-PJ, Markowitz S, Willson JKV, Hamilton SR, Kinzler KW, Kane MF, Kolodner RD, Vogelstein B, Kunkel TA, Baylin SB: Incidence and functional consequences of *hMLH1* promoter hypermethylation in colorectal carcinoma. *Proc. Natl. Acad. Sci. USA.* 95:6870-6875, 1998.
43. Veigl ML, Kasturi L, Olechnowicz J, Ma A, Lutterbaugh JD, Periyasamy S, Li G-M, Drummond J, Modrich PL, Sedwick WD, Markowitz SD: Allelic inactivation of *hMLH1* by epigenetic gene silencing, a novel mechanism causing human MSI cancers. *Proc Natl Acad Sci (USA)*. 95:8698-8702, 1998.
44. Grady WM, Rajput A, Myeroff L, Liu DF, Kwon K, Willis J, Markowitz S: Mutation of the type II Transforming Growth Factor- $\beta$  receptor is coincident with the transformation of human colon adenomas to malignant carcinomas. *Cancer Res.* 58:3101-3104, 1998.
45. Eshleman JR, Casey G, Kochera ME, Sedwick WD, Swinler SE, Veigl ML, Willson JKV, Schwartz S, Markowitz SD: Chromosome number and structure both are markedly stable in RER colorectal cancers and are not destabilized by mutation of p53. *Oncogene.* 17:719-725, 1998.
46. Polyak K, Yunbo L, Hong Z, Lengauer C, Willson JKV, Markowitz SD, Trush MA, Kinzler KW, Vogelstein B: Somatic mutations of the mitochondrial genome in human colorectal tumours. *Nature Genetics.* 20:291-293, 1998
47. Grady WM, Myeroff LL, Swinler SE, Rajput A, Thiagalingam S, Lutterbaugh JD, Neumann A, Brattain MG, Chang J, Kim S-J, Kinzler KW, Vogelstein B, Willson JKV, Markowitz S. Mutational inactivation of Transforming growth factor  $\beta$  receptor type II in microsatellite stable colon cancers. *Cancer Res.* 59:320-324, 1999.
48. Guilford PJ, Hopkins JBW, Grady WM, Markowitz SD, Willis J, Lynch H, Rajput A, Wiesner GL, Lindor HM, Burgart LJ, Toro TT, Lee D, Limacher J-M, Shaw DW, Findlay MPN, Reeve AE. E-Cadherin germline mutations define an inherited cancer syndrome dominated by diffuse gastric cancer. *Hum Mutat.* 14:2499-255, 1999.

49. Chen W-D, Eshleman JR, Aminoshariae MR, Ma A-H, Veloso N, Markowitz SD, Sedwick WD, Veigl ML. Cytotoxicity and mutagenicity of frameshift-inducing agent ICR191 in mismatch repair-deficient colon cancer cells. *J Natl Cancer Inst.* 92: 480-485, 2000. (SM corresponding author)
50. Yan H, Papadopoulos N, Marra G, Perrera C, Jiricny J, Boland CR, Lynch HT, Chadwick RB, de la Chapelle A, Berg K, Eshleman JR, Yuan W, Markowitz S, Laken SJ, Lengauer C, Kinzler KW, Vogelstein B. Conversion of diploidy to haploidy. *Nature.* 403:723-724, 2000.
51. Ma A-H, Xia L, Littman SJ, Swinler S, Lader G, Polinkovsky A, Olechnowicz J, Kasturi L, Lutterbaugh J, Modrich P, Veigl ML, Markowitz SD, Sedwick WD. Somatic mutation of *hPMS2* as a cause of sporadic human colon cancer with Microsatellite instability. *Oncogene.* 19:2249-2256, 2000.
52. Pretlow T, Schwartz S, Giaconia J, Wright A, Grimm H, Edgehouse N, Murphy J, Markowitz S, Jamison J, Summers J, Hamlin C, MacLennan G, Resnick M, Pretlow T, Connell C: Prostate cancer and other xenografts from cells in peripheral blood of patients. *Cancer Res.* 60:4033-4036, 2000.
53. Grady W, Willis J, Guilford P, Dunbier A, Toro T, Lynch H, Wiesner G, Ferguson K, Eng C, Park JG, Kim SJ, Markowitz S: Methylation of the *CDH1* promoter as the second genetic hit in hereditary diffuse gastric cancer. *Nature Genet* 26:16-17, 2000.
54. Lynch H, Grady W, Lynch J, Tsuchiya K, Wiesner G, Markowitz S: E-Cadherin mutation-based genetic counseling and hereditary diffuse gastric carcinoma. *Cancer Genet Cytogenet* , 122:1-6, 2000.
55. Fink S, Swinler S, Lutterbaugh J, Massague J, Thiagalingam S, Kinzler K, Vogelstein B, Willson J, Markowitz S: Transforming growth factor-beta induced growth inhibition in a *Smad4* mutant colon adenoma cell line. *Cancer Res.* 61:256-260, 2001.
56. Grady Wm, Rajput A, Lutterbaugh JD, Markowitz SD. Detection of Aberrantly Methylated *hMLH1* promotor DNA in the serum of patients with microsatellite unstable colon cancer. *Cancer Res.* 61:900-902, 2001.
57. Thiagalingam S, Laken S, Willson JK, Markowitz SD, Kinzler KW, Vogelstein B, Lengauer C: Mechanisms underlying losses of heterozygosity in human colorectal cancers. *Proc Natl Acad Sci U S A.* 98:2698-2702., 2001.
58. Wiesner G, Platzer P, Buxbaum S, Lewis S, MacMillen M, Olechnowicz J, Willis J, Chakravarti A, Elston R, Markowitz S: Testing for Colon Neoplasia Susceptibility Variants at the Human *COX2* Locus. *J Natl Cancer Inst.* 93:635-639, 2001.
59. Forgacs E, Wren JD, Kamibayashi C, Kodo M, Xu XL, Markowitz S, Tomlinson GE, Muller CY, Gazdar AF, Garner HR, Minna JD: Searching for microsatellite mutations in coding regions in lung, breast, ovarian and colorectal cancers. *Oncogene.* 20:1005-1009, 2001.
60. Zhang L, Yu J, Willson JKV, Markowitz S, Kinzler K, Vogelstein B: Short mononucleotide repeat sequence variability in mismatch repair deficient cancers. *Cancer Res.* 61:3801-3805, 2001.
61. Hahm KB, Im YH, Parks TW, Park SH, Markowitz S, Jung HY, Green J, Kim SJ. Loss of transforming growth factor beta signaling in the intestine contributes to tissue injury in inflammatory bowel disease. *Gut.* 49(2):190-198, 2001.
62. Zhou H, Chen WD, Qin X, Lee K, Liu L, Markowitz SD, Gerson SL. MMTV promoter hypomethylation is linked to spontaneous and MNU associated c-neu expression and mammary carcinogenesis in MMTV c-neu transgenic mice. *Oncogene.* 20(42):6009-6017, 2001.
63. Wang TL, Rago C, Silliman N, Ptak J, Markowitz S, Willson JK, Parmigiani G, Kinzler KW, Vogelstein B, Velculescu VE. Prevalence of somatic alterations in the colorectal cancer cell genome. *Proc Natl Acad Sci U S A* 99:3076-80, 2002.
64. Platzer P, Upender MB, Wilson K, Willis J, Lutterbaugh J, Nosrati A, Willson JK, Mack D, Ried T, Markowitz S. Silence of chromosomal amplifications in colon cancer. *Cancer Res* 62(4):1134-8,2002.
65. Li H, Myeroff L, Kasturi L, Krumroy L, Schwartz S, Willson JK, Stanbridge E, Casey G, Markowitz S. Chromosomal autonomy of *hMLH1* methylation in colon cancer. *Oncogene* 21(9):1443-9 2002.
66. Yan H, Dobbie Z, Gruber SB, Markowitz S, Romans K, Giardiello FM, Kinzler KW, Vogelstein B. Small changes in expression affect predisposition to tumorigenesis. *Nat Genet* 30(1):25-6, 2002
67. Zawel L, Yu J, Torrance C. J., Markowitz S, Kinzler K. W., Vogelstein B., and Zhou, S. *DEC1* is a downstream target of TGF-beta with sequence-specific transcriptional repressor activities, *Proc Natl Acad Sci U S A* 99:2848-2853, 2002.
68. Moinova HR, Chen WD, Shen L, Smiraglia D, Olechnowicz J, Ravi L, Kasturi L, Myeroff L, Plass C, Parsons R, Willson J, Green S, Issa J, Markowitz S: *HLTF* gene silencing in human colon cancer. *Proc Natl Acad Sci U S A* 99:4562-67, 2002.
69. Fink S, Mikkola D., Wilson J., Markowitz S: TGF- $\beta$ -Induced Nuclear Localization of *Smad2* and *Smad3* in *Smad4* Null Cancer Cell Lines. *Oncogene* 22: 1317-23, 2003.

70. Brunschwig E, Wilson K, Mack D, Dawson DM, Lawrence E, Wilson JKV, Lu S, Nosrati A, Swinler S, Beard L, Lutterbaugh J, Willis J, Platzer P, Markowitz S. PMEPA1, a TGF-beta induced marker of terminal colonocyte differentiation whose expression is maintained in primary and metastatic colon cancer. *Cancer Res* 63: 1568-75, 2003.
71. Hempen PM, Zhang L, Bansal RK, Iacobuzio-Donahue CA, Murphy KM, Maitra† A, Vogelstein B, Whitehead RH, Markowitz SD, Willson JKV, Yeo CJ, Hruban RH, Kern SE. Evidence of selection for clones having genetic inactivation of the activin A type II receptor gene in gastrointestinal cancers. *Cancer Res* 63: 994-99, 2003.
72. Bardelli A, Parsons W, Silliman N, Ptak J, Szabo S, Saha S, Markowitz S, Willson J, Parmigiani G, Kinzler K, Vogelstein B, Velculescu V. Mutational Analysis of the Tyrosine Kinome in Colorectal Cancers. *Science* 300:949, 2003.
73. Li H, Myeroff L, Smiraglia D, Romero MF, Pretlow TP, Lakshmi Kasturi L, Lutterbaugh J, Casey G, Issa J-P, Willis J, Willson JKV, Plass C, Markowitz SD. SLC5A8: A novel sodium transporter, is a tumor suppressor gene silenced by methylation in human colonic aberrant crypt foci and colon cancers. *Proc Natl Acad Sci U S A* 100: 8412-17, 2003.
74. Wiesner G., Daley D., Lewis S., Ticknor C., Platzer P., Lutterbaugh J., MacMillen M., Baliner B., Willis J., Elston R.C., Sanford D. Markowitz S.D. A subset of familial colorectal neoplasia kindreds linked to chromosome 9q22.2-31.2 *Proc Natl Acad Sci U S A* 100: 12961-65, 2003.
75. Bardelli A, Saha S, Sager JA, Romans KE, Xin B, Markowitz SD, Lengauer C, Velculescu VE, Kinzler KW, Vogelstein B. PRL-3 expression in metastatic cancers. *Clin Cancer Res* 9:5607-5615, 2003.
76. Ionov Y, Nowak N, Perucho M, Markowitz S, Cowell JK. Manipulation of nonsense mediated decay identifies gene mutations in colon cancer cells with microsatellite instability. *Oncogene* 23:639-645, 2004.
77. Suzuki H, Watkins DN, Jair KW, Schuebel KE, Markowitz SD, Dong Chen W, Pretlow TP, Yang B, Akiyama Y, Van Engeland M, Toyota M, Tokino T, Hinoda Y, Imai K, Herman JG, Baylin SB. Epigenetic inactivation of SFRP genes allows constitutive WNT signaling in colorectal cancer. *Nat Genet* 36:417-22, 2004.
78. Samuels Y, Wang Z, Bardelli A, Silliman N, Ptak J, Szabo S, Yan H, Gazdar A, Powell SM, Riggins GJ, Willson JK, Markowitz S, Kinzler KW, Vogelstein B, Velculescu VE. High frequency of mutations of the PIK3CA gene in human cancers. *Science* 304:554, 2004.
79. Wang Z, Cummins JM, Shen D, Cahill DP, Jallepalli PV, Wang TL, Parsons DW, Traverso G, Awad M, Silliman N, Ptak J, Szabo S, Willson JK, Markowitz SD, Goldberg ML, Karess R, Kinzler KW, Vogelstein B, Velculescu VE, Lengauer C. Three classes of genes mutated in colorectal cancers with chromosomal instability. *Cancer Res* 64:2998-3001, 2004.
80. Wang Z, Shen D, Parsons DW, Bardelli A, Sager J, Szabo S, Ptak J, Silliman N, Peters BA, Van Der Heijden MS, Parmigiani G, Yan H, Wang TL, Riggins G, Powell SM, Willson JK, Markowitz S, Kinzler KW, Vogelstein B, Velculescu VE. Mutational analysis of the tyrosine phosphatome in colorectal cancers. *Science* 304:1164-1166, 2004.
81. Friedman JB, Brunschwig EB, Platzer P, Wilson K, Markowitz SD. C8orf4 is a transforming growth factor  $\beta$  induced transcript downregulated in metastatic colon cancer. *Int J Cancer* 111:72-75, 2004.
82. Coady MJ, Chang MH, Charron FM, Plata C, Wallendorff B, Sah JF, Markowitz SD, Romero MF, Lapointe JY. The human tumor suppressor gene SLC5A8 expresses a Na<sup>+</sup>/monocarboxylate cotransporter. *J Physiol* 557:719-731, 2004.

#### PUBLICATIONS:

##### Reviews/Editorials

1. Markowitz S. Review of: Cell and Molecular Biology of Colon Cancer. Augenlicht, L. (ed.). In: *J Natl Cancer Inst* 82: 523-524, 1990.
2. Markowitz S. Molecular Biology of Colon Cancer. Willson J (ed). In: *Colorectal Cancer*. Cancer Center of the Medical College of Wisconsin Press, Milwaukee, WI 5-10, 1992.
3. Berger N, Willson J, Markowitz S, Levin B. Colorectal cancer 1994: Recent progress and future opportunities. In: Public Education Committee, American Association Cancer Research (Ed) *Cancer Fact Sheets*. AACR, 1994.
4. Myeroff L. and Markowitz S. Nm23--into the basement (membrane). In: *J Natl Cancer Inst* 86: 1815-1817, 1994.
5. Eshleman J. and Markowitz S. Microsatellite instability in inherited and sporadic human neoplasms. In: *Current Opinion in Oncology*. 7: 83-89, 1995.

6. Brattain M, Markowitz S, Willson JKV. The type II TGF-beta receptor as a tumor suppressor gene. In: Current Opinion in Oncology. 8:49-53, 1996.
7. Markowitz S. and Roberts A. Tumor suppressor activity of the TGF-beta pathway in human cancers. In: Cytokine and Growth Factor Reviews. 7:93-102, 1996.
8. Eshleman J. and Markowitz S. DNA repair defects in human carcinogenesis. Hum. Molec. Genet. 5:1489-1494, 1996.
9. Grady W, Rajput A, Myeroff L, Markowitz S. What's new with RII. Gastroenterology. 112:297-302, 1997
10. Mucachy G, Goggins M, Decker R, Luce M, Parsons R, Markowitz S, Narod S, Holt J, Page D, Mauer A, Thor A. The American Cancer Society's workshop on heritable cancer syndromes and genetic testing: Pathology and genetic testing. Cancer. 80:636-648, 1997.
11. Markowitz S. DNA repair defects inactivate tumor suppressor genes and induce hereditary and sporadic colon cancers. ASCO Education Book Spring. 20-26, 1997.
12. Markowitz S. Atherosclerosis, Just Another Cancer. J. Clin. Invest. 100:2143-2145, 1997.
13. Markowitz S. DNA repair defects inactivate tumor suppressor genes and induce hereditary and sporadic colon cancers. 1999 ASCO Education Book: 56-62, 1999.
14. Sedwick WD, Markowitz S, Veigl M: Mismatch repair and drug responses in cancer. Drug Resistance Updates 2:295-306, 1999
15. Markowitz S. TGF- $\beta$  receptors and DNA repair genes, coupled targets in a pathway of human colon carcinogenesis. Biochim Biophys Acta. 1470:M13-M20, 2000.
16. Grady WM, Markowitz S. Genomic instability and colorectal cancer. In: Current Opinion in Gastroenterology. 16:62-67, 2000.
17. Kim S-J, Im YH, Markowitz S, Bang YJ: Molecular mechanisms of inactivation of TGF-beta receptors during carcinogenesis. Cytokine and Growth Factor Reviews 11:159-168, 2000.
18. Markowitz S: DNA repair defects inactivate tumor suppressor genes and induce hereditary and sporadic colon cancers. J. Clin Oncol. 18:75s-80s, 2000.
19. Markowitz S, Dawson DM, Willis J, Willson JK: Focus on colon cancer. Cancer Cell 2002;1:233-36.
20. Grady WM, Markowitz SD: Genetic and epigenetic alterations in colon cancer. Annu Rev Genomics Hum Genet 2002;3:101-28.
21. Markowitz S. DNA repair defects inactivate tumor suppressor genes and induce hereditary and sporadic colon cancers. 2003 ASCO Education Book: 4-11, 2003.
22. Grady WM, Markowitz SD. Hereditary colon cancer genes. Methods Mol Biol 222:59-83, 2003.

#### **PUBLICATIONS:**

##### Edited Books/Periodicals

1. Cancer Biology (Markowitz S, ed.) In: Current Opinion in Oncology. 9:79-112, 1997.
2. Cancer Biology (Markowitz S, ed.) In: Current Opinion in Oncology. 10:67-91, 1998.
3. Myeroff L, He H, Fink S, Markowitz S: Mutation detection in the TGF-beta receptors and Smad genes: RT-PCR and sequencing. In Methods Mol Biol (Howe P, ed). Totowa, NJ: Humana Press, 2000, pp 139-147.
4. Myeroff L, Markowitz S: Detection of TGF-beta type II receptor hot-spot mutations: the BAT-RII assay. In Methods in Molecular Biology (Howe P, ed). Totowa, N.J.: Humana Press, 2000, pp 133-137.
5. Mendlesohn J, Baird A, Fan Z, Markowitz S. Growth factors and their receptors in epithelial malignancies. In The Molecular Basis of Cancer (Mendlesohn J, Howley P, Israel M, Liotta L, editors) Philadelphia: W.B. Saunders; 2001, pp 136-161.
6. Grady W, Markowitz S: Colorectal cancer: genetic alterations. In Kelsen D, Daly J, Kern S, Levin B, Tepper J, editors. Gastrointestinal oncology principles and practice. Philadelphia: Lippincott, Williams and Wilkins, 2002, p. 685-702.

#### **PUBLICATIONS:**

##### Abstracts

1. Kelly J, Malech H, Markowitz S: Monoclonal antibodies used to detect polymorphonuclear neutrophil specific surface antigens on normal myeloid and non lymphocytic leukemia cells. Clin Res 30: 32A, 1982.
2. Malech H, Kelley J, Markowitz S: Biochemical characterization of human polymorphonuclear neutrophil specific membrane antigens. Clin Res 30: 323A, 1982.
3. Todd M, Malech H, Rome L, Waldron J, Markowitz S, Jennings T, Holford T, Gardner J, Wolak J: Myeloid antigen loss precedes blast transformation in chronic myelogenous leukemia. Proc AACR 27: A1324, 1986.

4. Lebacqz-Verheyden A, Sausville E, Krystal G, Markowitz S, Cuttita F, Battey J: The gastrin releasing peptide gene produces multiple peptide hormones by alternative RNA processing. *J Cell Biochem Suppl* 11A: A004, 1987.
5. Markowitz S, Battey J: Control of expression of the C-Myc and Grp genes in human small cell lung cancer cell lines. *J Cell Biochem Suppl* 11A: A147, 1987.
6. Markowitz S, Battey J: Control of expression of C-Myc and Grp genes in human small cell lung cancer cell lines. *J Cell Proc Am Soc Clin Oncol* 6: A61, 1987.
7. Markowitz S, Molkentin K, Gerbic C, Willson J: Autocrine growth stimulation by transforming growth factor- $\alpha$  in human colon adenomas. *Proc AACR* 31: A269, 1990.
8. Markowitz S, Baker S, Vogelstein B, Molkentin K, Jackson J, Willson J: Transforming activity of mutant p53 in colon adenoma cell lines. *Proc AACR* 31: A1835, 1990.
9. Markowitz S, Molkentin K, Lutterbaugh J, Yang B, Willson J: Combined mutant ras and p53 alleles cause morphologic transformation and growth arrest in a human colon polyp cell line. *Proc AACR* 32: A1692, 1991.
10. Markowitz S, Myeroff L, Yang B, Molkentin K, Lyon M, Willson J: EJ-ras induces morphologic transformation and growth arrest in a human colon adenoma cell line containing a mutant p53 allele. *J Cell Biochem Suppl* 16B:G322.
11. Markowitz S, Myeroff L, Lutterbaugh J, Lyon M, Zborowska E, Kochera M, and Willson J: Spontaneous progression of a colon adenoma cell line via a p53 independent pathway. *Proc AACR* 33, A740, 1992.
12. Gerson S, Markowitz S, Willson J: Induction of BCNU resistance in a sensitive colon cancer xenograft by transfection of alkyltransferase MGMT: a model for tumor drug resistance heterogeneity. *Proc AACR* 34: A1609, 1993.
13. Berger S, Tsai M, Chatterjee S, Markowitz S, Willson J, Berger N: Transcriptional down regulation of topoisomerase 2 relative to topoisomerase 1 in normal and malignant human colon tissues, implications for therapy of colon cancer. *Proc AACR* 34: A1952, 1993.
14. Markowitz S, Myeroff L, Cooper M, Yang B, Lutterbaugh J, Lyon M, Willson J: Dominant p53 mutations do not induce TGF- $\beta$  independence or phenotypic progression in a colon adenoma cell line. *Proc AACR* 34: A3128, 1993.
15. Willson J, Markowitz S: Development of colon adenomatous cell culture: Similarities and differences in growth control mechanisms of colon adenomas and carcinomas. *Proc 26th Advances in the Biology and Therapy of Colorectal Cancer*. 31, 1993.
16. Markowitz S, Myeroff L, Lutterbaugh J, Lyon M, Zborowska E, Kochera M, Willson J: Three genetically altered colon cancer oncogenes are present in a benign colon adenoma, which progresses to tumorigenicity and growth factor independence without inactivating the p53 tumor suppressor gene. *J Cell Biochemistry Suppl* 18C: N512, 1994.
17. Traicoff J, Myeroff L, Willson J, Markowitz S: The DCC colon cancer suppressor gene is fully silent in a subset of nonmalignant colon adenomas. *Proc AACR* 35: A3475, 1994.
18. Gerson S, Lia L, Philips W, Zaidi N, Heist A, Markowitz S, Willson J: Drug resistance mediated by DNA repair: The paradigm of O<sup>6</sup>-alkylguanine DNA alkyltransferase. *Proc AACR* 35: 699, 1994.
19. Wang J, Willson J, Gentry L, Wang X, Yang J, Liang J, Markowitz S, Brattain M, Sun L: Expression of TGF- $\beta$  receptors type I and II in human colon carcinoma cell lines. *Proc AACR* 36: A3433, 1995.
20. Eshleman J, Lang E, Lutterbaugh J, Bowerfind G, Parsons R, Vogelstein B, Willson J, Veigl M, Markowitz S, Sedwick WD: Molecular analysis of spontaneous mutations in colon cancer exhibiting microsatellite instability. *Proc AACR* 36: A861, 1995.
21. Eshleman J, Lang E, Lutterbaugh J, Bowerfind G, Parsons R, Vogelstein B, Willson JKV, Markowitz S, Veigl M, Sedwick WD: Spontaneous mutations in colon cancer: molecular analysis of mutations exhibiting microsatellite instability. *Environ Mol Mutagen* 25(suppl 25): 14, 1995.
22. Liu L, Markowitz S, Willson J, Gerson S: Mismatch repair mutator phenotype confers resistance to temozolomide in human colon cancer cell lines. *Proc AACR* 37: A2491, 1996.
23. Eshleman J, Markowitz S, Donover P, Lutterbaugh J, Lang E, Veigl M, Sedwick W: Specific expressed sequence motifs are hypermutable in RER tumors. *Proc AACR* 37: A3737, 1996.
24. Eshleman J, Markowitz S, Donover P, Lutterbaugh J, Lang E, Veigl M, Sedwick W: RER Tumors show hypermutability of expressed sequence motifs. Presented at the Environ Mutagen Society Annual Meeting, Victoria, B.C., Canada; *Environ & Molec Mutag*, 27:Suppl: 72.
25. Eshleman J, Donover P, Swinler S, Lutterbaugh J, Willson JKV, Sedwick W, Markowitz S, and Veigl M. A novel colon cancer mutator phenotype predominantly causes transversion based substitutions. Presented at the Amer Assoc Cancer Res Annual Meeting, San Diego, CA; *Proc AACR*, 37: 546.



26. Eshleman J, Donover P, Swinler S, Lutterbaugh J, Sedwick W, Markowitz S, and Veigl M. Transversions predominate the spectrum of a novel colon cancer mutator phenotype. Presented at the Environ Mutagen Society Annual Meeting, Minneapolis, MN; Environ & Molec Mutag, 29:Suppl.28: 15.
27. Grady W, Rajput A, Myeroff L, Willis J, Kwon K, Markowitz S: TGF- $\beta$  Receptor Type II Mutations and Microsatellite Instability in Colonic Adenomatous Polyps. Gastroenterology 112:4, 1997.
28. Grady W, Dolinak D, Willis J, Rajput A, Markowitz S. TGF- $\beta$  receptor type II mutations and microsatellite instability in gastric cancer: a comparison to histology, state, and site in the stomach. Gastroenterology. 112:A571, 1997.
29. Grady WM, Myeroff LL, Swinler SE, Rajput A, Thiagalingam S, Lutterbaugh JD, Neumann A, Brattain MG, Kim S-J, Kinzler KW, Vogelstein B, Willson JKV, Markowitz S. Mutational Inactivation of TGF- $\beta$  Receptor Type II in Microsatellite Stable Colon Cancers. Presented at Keystone Symposia on Molecular and Cellular Biology, Molecular Mechanisms for Gastrointestinal Cancer, Keystone CO, April 1-7, 1999.
30. VanDerMark P, Wiesner G, Olechnowicz J, MacMillen M, Elston R, Chakravarti A, Markowitz S, and CWRU Colon Neoplasia Sibling Study. Linkage Analysis of Candidate Cancer Susceptibility Genes in Colorectal Cancer Sibpairs. Presented at Keystone Symposia on Molecular and Cellular Biology, Molecular Mechanisms for Gastrointestinal Cancer, Keystone CO, April 1-7, 1999.
31. Wiesner GL, VanDerMark P, Elston R, Chakravarti A, Markowitz S, and the CWRU Colon Neoplasia Sibling Study. Affected Sibpair Linkage Analysis of the NAT Locus on 8p21-23 in Colon Neoplasia Kindreds. Presented at Keystone Symposia on Molecular and Cellular Biology, Molecular Mechanisms for Gastrointestinal Cancer, Keystone CO, April 1-7, 1999.
32. Liu D-F, Grady W, Rajput A, Markowitz S, Willis J. p27<sup>KIP1</sup> expression inversely correlates with microsatellite instability and TGF- $\beta$  receptor type II mutations in sporadic colon cancer. Gastroenterology 114:G2619, 1998.
33. VanDerMark P, Wiesner G, Olechnowicz J, MacMillan M, Elston R, Chakravarti A, Markowitz S, and CWRU Colon Neoplasia Sibling Study. Linkage analysis of candidate cancer susceptibility genes in colorectal cancer sibpairs. Proc AACR 40:912, 1999.
34. Ma A-H, Xia L, Swinler S, Lader G, Polinkovsky A, Kasturi L, Lutterbaugh J, Modrich P, Willson J, Veigl M, Markowitz SD, Sedwick WD. Characterization of a novel hPMS2 deficient human colon cancer cell line. Proc AACR 40:915, 1999.
35. Chen W-D, Sedwick WD, Markowitz S, Aminoshariae B, Eshleman JR, Ma A-H, Veloso N, Veigl ML. Mismatch repair deficiency sensitizes human cancer cells to frameshift mutations caused by the prototype antitumor agent ICR191. Proc AACR 40:1020, 1999.
36. Grady WM, Myeroff LL, Swinler SE, Rajput A, Thiagalingam S, Lutterbaugh JD, Neumann A, Brattain MG, Kim S-J, Kinzler KW, Vogelstein B, Willson JKV, Markowitz S. Mutational inactivation of TGF- $\beta$  receptor type II in microsatellite stable colon cancers. Proc AACR 40:1811, 1999.
37. Donover PS, Greenstein JE, Leonard CP, Veigl ML, Sedwick WD, Markowitz SD, Eshleman JR. Increased sensitivity of mismatch repair defective cells to the frameshift mutagen ICR191. Proc AACR 40:2104, 1999.
38. Wiesner GL, Grady WM, Shrigley R, Markowitz S, and the CWRU Colon Neoplasia Sibling Study. Use of Bethesda criteria for microsatellite instability testing for HNPCC: Survey of 101 colon neoplasia families. Proc AACR 40:4014, 1999.
39. Grady WM, Olechnowicz J, Markowitz S, Willis J. Transforming growth factor  $\beta$  receptor type II mutations associate with increased expression of CDK4 in colon cancer. Gastroenterology 116(4):G1814, 1999.
40. Liu D, Fergusson K, Cooper G, Markowitz S, Willis J. Alterations in BC1-X and Bak protein expression in 5-Fluorouracil-treated liver metastases from colon cancer. Am J Clin Pathol. 112:542, 1999.
41. Platzer P, Ferguson S, Olechnowicz J, Ogino S, Holko M, Dawson D, Lutterbaugh JD, Schwartz S, and Markowitz SD. Mutational Analysis of the TGF- $\beta$  receptor superfamily in human cancer. Proc AACR 41:1007, 2000.
42. Grady W, Rerko RM, and Markowitz SD. TGF- $\beta$  receptor type II reconstitution sensitizes colon cancer to 5-fluorouracil. Proc AACR 41:3383, 2000.
43. Wiesner FL, Buxbaum S, Platzer P, McMillan M, Elston R, and Markowitz SD. COX2 is not a susceptibility gene for common forms of human colon neoplasia. Proc AACR 41:4747, 2000.
44. Fink SP, Swinler SE, Brady RS, Lutterbaugh JD, Willson JKV, and Markowitz SD. TGF- $\beta$  induced growth inhibition in a colon cell line containing a mutant SMAD4 that does not transcriptionally activate TGF- $\beta$  responsive reporters. Proc AACR 41:5208, 2000.



45. He H and Markowitz SD. Mutations of TGF- $\beta$  type I receptor are very rare in human colon cancer cell lines. *Proc AACR* 41:5209, 2000.
46. Forgacs E, Wren JD, Kamibayashi C, Kondo M, Xu XL, Markowitz S, Tomlinson GE, Muller CY, Gazdar AF, Garner HR, and Minna JD. Computational biology and laboratory search of multiple genes for coding region microsatellite mutations in lung, breast, ovarian and colorectal cancer. *Proc AACR* 42:2852, 2001
47. Daley D, Elston RD, Weiss A, Clark A, Macmillen M, Lewis S, Markowitz S, and Wiesner GL. Linkage between colon neoplasia and the NAT locus in the Cleveland colon neoplasia sibling study. *AACR* 43:2807, 2002.
48. Li H, Myeroff L, Kasturi L, Kumroy L, Schwartz S, Willson JKV, Stanbridge E, Markowitz S. Chromosomal autonomy of hMLH1 methylation in colon cancer. *AACR* 43:810, 2002.
49. Fink SP, Olechnowicz J, Thiagalingam S, Vogelstein B, Willson JKV, and Markowitz S. Smad2 and Smad4 mutations as partial determinants of 18q deletion in colon cancer. *AACR* 43:1404. 2002.
50. Fink SP, Mikkola D, Willson JKV, and Markowitz S. TGF- $\beta$ -induced nuclear localization of Smad2 and Smad3 in Smad4 null cancer cell lines. *AACR* 43:3050. 2002.
51. Moinova HR, Chen WD, Shen L, Smiraglia D, Olechnowicz J, Ravi L, Kasturi L, Myeroff L, Plass CH, Parsons R, Minna J, Willson JKV, Green SB, Issa JP, and Markowitz SD. A SWI/SNF family member gene is frequently silenced in human colon cancer. *AACR* 43:2466, 2002.
52. Platzer P, Upender M, Wilson K, Willis J, Lutterbaugh J, Nosrati A, Willson J, Mack D, Ried T, and Markowitz S. Silence of chromosomal amplifications in colon cancer. *Oncogenomics* 2002; Dublin, Ireland; May 2002
53. Platzer P, Fink S, Xin B, Moinova H, Chen W, Rao S, Willis J, Ghandour G, Mack D, Wilson K, and Markowitz S. Colon cancer target identification. Director's Challenge PI Meeting; Bethesda MD; November 2002.